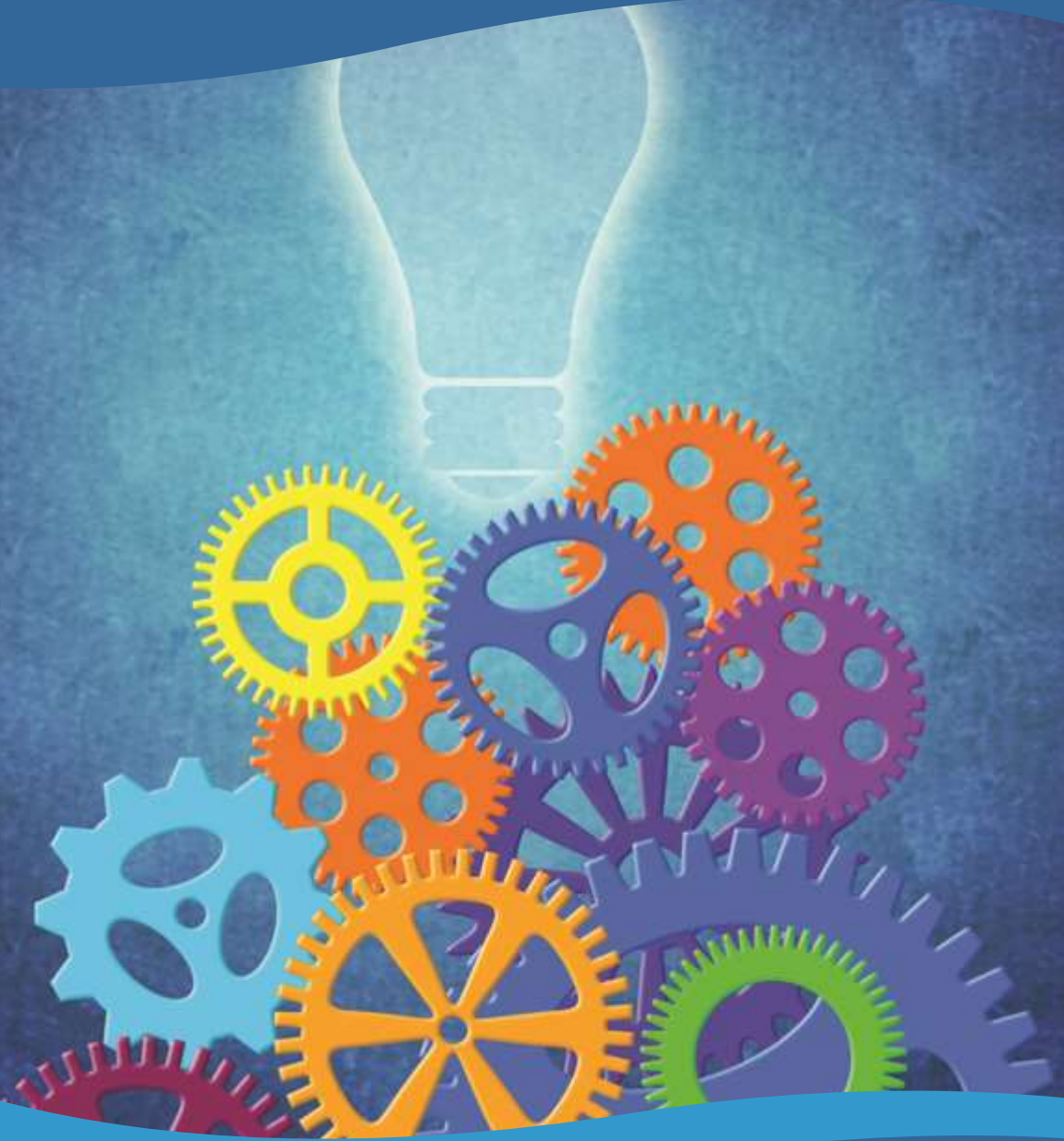


# ICFAR 2025



**6th International Conference on Frontiers in Academic Research  
ICFAR 2025**

December 16-17, 2025: Konya, Turkey

**Abstract Book**

ABSTRACT BOOK OF  
6TH INTERNATIONAL  
CONFERENCE ON  
FRONTIERS IN  
ACADEMIC RESEARCH  
ICFAR 2025

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## **INTRODUCTION**

We had the great honor of 6th International Conference on Frontiers in Academic Research ICFAR 2025. It was truly a great pleasure for us to greet a lot of participants from many different countries to attend ICFAR 2025! We firmly believe that the conference will become an important international event in the field of cross-industry discussion about innovations in Academic Studies.

Three cooperating organizations supported the two-day conference. There were 487 papers accepted for presentation at ICFAR 2025, contributed from different countries. We had plenary speeches and several well-known scientists and experts, to give invited talks at different sessions.

The purpose of ICFAR 2025 was to provide a forum for the participants to report and review innovative ideas, with up-to-date progress and developments, and discuss novel approaches to the application in the field of their own research areas and discuss challenges of doing science.

We sincerely hope that the exchange of ideas on doing research, science and improving education will help the participants, and international cooperation sharing the common interest will be enhanced.

On behalf the Organization Committee of ICFAR 2025, we would like to heartily thank our cooperating organizations for all they have done for the conference. We would also like to thank the authors for their contribution to the proceedings; the participants and friends of ICFAR 2025, for their interest and efforts in helping us to make the conference possible; and the Editorial boards for their effective work and valuable advice, especially the ICFAR 2025 secretariat and the ICFAR 2025 staff, for their tireless efforts and outstanding services in preparing the conference and publishing the Proceedings.

Publisher: All Sciences Academy

**TABLE OF CONTENTS**

Introduction .....	II
Table of Contents .....	III
Conference Chairs .....	XXII
Scientific Committees .....	XXIII
Document of Academic Incentive .....	XIV
Document of International Conference .....	XV

**Table List of Content****Content of Abstract Papers**

Page No	Title	Authors	Country	Submission ID
1	FROM INSTABILITY TO BIOEFFICACY: NANO-ENCAPSULATION OF POLYPHENOLS IN BEVERAGES	Mahwash Aziz	Pakistan	Submission 216
2	Harnessing Citrus Lemon Peel Extract for the Sustainable Synthesis and Solar-Driven Photocatalytic Efficacy of Titanium Dioxide Nanoparticles in Dye Remediation	Sofiane khane, Yasmina Khane, Fares Fenniche	Algeria, Algeria, Algeria	Submission 217
3	Fostering Critical & Ethical Competence Beyond the Tool: Cultivating Critical AI Literacy and Ethical Reasoning in Pre-service EFL Teacher Education	SEBBAH Djamel	Algeria	Submission 220
4	Solar Panel Detection Using Convolutional Neural Networks	Berrimi Fella	Algeria	Submission 221
5	Blow-up of Timoshenko System	BAIBECHÉ SABAH, Slimani Ali, Bouzettouta Lamine, Karek Chafia	Algeria, Algeria, Algeria, Algeria	Submission 223
6	Robust Energy Management Strategy for PV–Battery Systems in Residential Applications	Toufik Sebbagh, Amina Gabour, Beldjaatit Chahinez	Algeria, Algeria, Algeria	Submission 224
7	Blockchain as a Catalyst for Transparent Requirement Engineering in GSD	Asif Ahmad, Zain Ul Iman, Muhammad Saad Asif	Pakistan, Pakistan, Pakistan	Submission 233
8	Hesaplamalı yöntemler kullanılarak Parkinson hastalığı için bitki bazlı ilaç adaylarının analizi	Emre Aktaş, Nehir Özdemir Özgentürk	Turkey, Turkey	Submission 234
9	Seismic Performance Assessment of RC Frames with Masonry Infills Considering In-Plane and Out-of-Plane Interaction	Abdelghaffar Messaoudi	Algeria	Submission 245
10	Modeling the Dynamic Behavior of a Wind Turbine	Salhi Houria, Hamou Nouri, Meziane Kaci, Hakim Ait Said, Massinissa Aïssou	Algeria, Algeria, Algeria, Algeria, Algeria	Submission 246
11	Çok Duvarlı Karbon Nanotüp İçeren Dizel Karışımlarla Yük Bağımlı Motor Davranışının Deneysel Analizi	Mehmet ÇELİK, Ezgi Nur ÇOMAK, Emin Arda DEMİRCİ	Turkey, Turkey, Turkey	Submission 247
12	Heat Dissipation Enhancement in Gyroid-Based TPMS Geometry	Khaoula Amara, Ridha Abdeljabar	Tunisia, Tunisia	Submission 248
13	Contribution to the identification of necrophagous insects in the Guelma region	Widad Belkhir, Fatma Djamaa, Yousra Bounab	Algeria, Algeria, Algeria	Submission 250
14	REGIONAL VARIATIONS IN BREAST CANCER PROFILES: A COMPARATIVE STUDY BETWEEN SOUK AHRAS AND SEDRATA, EASTERN ALGERIA	Khaoula Menaiaia	Algeria	Submission 257
15	Evaluating the Thermal Comfort Conditions in Traditional Mud Buildings of South-Eastern Nigeria	Akubue Jidefor Anselm	Nigeria	Submission 259
16	Earth homes; Building Design Process integrated with Nature	Akubue Jidefor Anselm	Nigeria	Submission 260
17	Design Concepts for Earth Sheltered Urban Ground-scrapers	Akubue Jidefor Anselm	Nigeria	Submission 261
18	Parametric analysis of the seismic behavior of reinforced concrete shear walls in buildings: application of the pushover method	Salem MERABTI, Amar MEZIDI, Abdellah BOODINA	Algeria, Algeria, Algeria	Submission 268
19	Mechanical behavior of fiber-reinforced concrete at high temperature	Fatma TAOUCHE-KHELOUI, Ourdia FEDAOUI-AKMOUSSI, Fatma BOUZEBODJA, Chafika ALI AHMED, Souad AIT TALEB, Abdelmadjid SI SALEM	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Submission 271
20	İKİ TABAKALI BİR PLAĞIN RİTZ YÖNTEMİ İLE HİGRO-TERMAL BURKULMA ANALİZİ	Turan Yazar, Şeref D. Akbaş	Turkey, Turkey	Submission 272
21	Design and Analysis of an RF Energy Harvesting System for Low-Power Electronic and IoT Applications	Atik Hasan Nishat, Saleha Nasrin Mishu, Nowrin Jannat, Prithwiraj Biswas Pallab, Firoz Ahmed, M. Hasnat Kabir	Bangladesh, Bangladesh, Bangladesh, Bangladesh,	Submission 277

			Bangladesh, Bangladesh, Bangladesh	
22	Microalgae culture: approaches and applications in aquaculture	Hadjer GOUDJIL, Sara HAMIODA	Algeria, Algeria	Submission 278
23	Free vibration analysis of composite beams on visco-Pasternak foundation using higher-order theory	Imene HEBBAR, Nabil HEBBAR, Farouk Yahia ADDOU	Algeria, Algeria, Algeria	Submission 282
24	Developing an Optimal Matrix Treatment Strategy for the Haoud Berkaoui Oil Fields - Algeria	Djamila Boufades, Zakaria Adjou, Souad Hammadou Née Mesdour	Algeria, Algeria, Algeria	Submission 283
25	Issuance Islamic Sukuk in Algeria: Legal Vacuum of Institutional Deficiencies and Practical Impediments	ZEROUKI Bouzned	Algeria	Submission 284
26	Sovereign Sukuk in Algeria Legislated by the Finance Ministry Decision dated on June 1, 2025	ZEROUKI Bouzned	Algeria	Submission 285
27	3D Numerical simulation of seismic failure of concrete gravity dams considering base sliding	Djamel Ouzandja	Algeria	Submission 287
28	Evaluation of the antioxidant activity of Nettle ( <i>Urtica dioica</i> ) using the FRAP assay	Rahmani Imene	Algeria	Submission 288
29	Research on Digital Skills Empowerment for Low-Skilled Workers by International Organization	Jun Jiang	China	Submission 296
30	The effects of climate change on genetic adaptation, animal welfare and production performance in dairy cattle	Ömer ERTEN	Turkey	Mail Submission 4
31	Corpus Linguistics: An Empirical Approach to the Study of Language	Mahdid Fatima Zohra, Mahdid kheira	Algeria, Algeria	Submission 297
32	Orijinal YOLOv9-M Mimarisine Entegre Edilmek Üzere Basic ve Bottleneck Yapılarını Birleştiren Hibrit Modülün EKG Analizine Etkisi	Fatma Akalın, Pınar Dervişoğlu Çavdaroğlu, Mehmet Fatih Orhan, Arda Doğu Ari	Turkey, Turkey, Turkey, Turkey	Submission 302
33	Orijinal YOLOv9-M Mimarisine Entegre Edilen Multi-Head Attention Yapısının EKG Analizine Etkisi	Fatma Akalın, Pınar Dervişoğlu Çavdaroğlu, Mehmet Fatih Orhan, Arda Doğu Ari	Turkey, Turkey, Turkey, Turkey	Submission 303
34	Tunable Electronic, Magnetic, Thermoelectric, and Photovoltaic Properties of Dodecagonal Graphene	R. Masrour	Morocco	Submission 307
35	Heterojunction-Engineered Double Perovskite Phosphors for Enhanced Optoelectronic and Photovoltaic Performance	R. Masrour	Morocco	Submission 308
36	DFT Investigation of the Electronic, Optoelectronic, and Photovoltaic Properties of Lead-Free Na <sub>0.2</sub> Bi <sub>0.3</sub> Zr <sub>0.5</sub> TiO <sub>2</sub> Ceramic	R. Masrour	Morocco	Submission 309
37	Second-order generalizations of special functions	Rahaf Habiba, Nihal Özdoğan	Turkey, Turkey	Submission 311
38	Renk Körü Bireylerin Web Erişilebilirliğindeki Kapsayıcı Dijital Deneyim İçin Tasarım Gereklilikleri	Fatma Akalın, Mehmet Fatih Orhan	Turkey, Turkey	Submission 312
39	Renk Körü Kullanıcılar İçin Web Tasarımında Erişilebilirlik	Fatma Akalın, Dilara Top, Esmâ Kara	Turkey, Turkey, Turkey	Submission 313
40	Preparation and Biological Screening of Hydrazones Using Isolated Cholic Acid	Talha Mashhood, Akbar Ali, Shehar Bano, Muhammad Ibrahim	Pakistan, Pakistan, Pakistan, Pakistan	Submission 314
41	Synthesis And Biological Screening of Amides using Coumarin-3-Carboxylic Acid	Shehar Bano, Muhammad Ibrahim, Talha Mashhood, Akbar Ali	Pakistan, Pakistan, Pakistan, Pakistan	Submission 316
42	Görme Algısı Optimizasyonu ve WCAG Kılavuzuna Uygunlaştırma	Fatma Akalın, Esmâ Kara, Dilara Top	Turkey, Turkey, Turkey	Submission 317
43	Natural Adsorbents for Heavy Metal Remediation: Comparative Study of Co(II) and Ni(II) Uptake by Chitosan and Marne Clay	Imane Lansari, Khadidja Tizaoui, Belkacem Benguella, Hasna Boudghene Stambouli	Algeria, Algeria, Algeria, Algeria	Submission 321
44	The Digital Revolution In Management And Its Impact On Business Strategies	Amal Algouti	Morocco	Submission 323
45	Seismic Modeling and Analysis of a Five-Story Reinforced Concrete Building	Rahli Roumaissa, Rahli Hibat Allah	Algeria, Algeria	Submission 328
46	Study of lithium-ion combinations for battery optimization	Rahli Hibat Allah, Rahli Roumaissa	Algeria, Algeria	Submission 329
47	The photodegradation of malachite green (MG) by new material FeWO <sub>4</sub>	BOUDGHENE STAMBOULI Hasna, GUENFOUD FOUAD, KARAOUZENE, KARAOUZANE GHERBI, Fayza Khadidja, LANSARI Imane	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Submission 331
48	Photocatalytic Degradation of Pharmaceutical pollutant: An Approach for Water Treatment	TIZAOUI Khadidja, LANSARI Imane	Algeria, Algeria	Submission 341
49	Adsorption of a textile dye from aqueous solution on natural and modified sawdust	Imane Lansari, Khadidja Tizaoui, Belkacem Benguella, Hasna Boudghene Stambouli	Algeria, Algeria, Algeria, Algeria	Submission 343
50	Enhancing Global Buckling of I-shaped Steel	Hassina Ziou, Yacine Bakhtaoui, Ilies	Algeria, Algeria,	Submission 348

	Beams with Transverse Stiffeners	Guendouz	Algeria	
51	Analysis of Conformable Derivatives in Graphene's Dirac-Weyl Dynamics	MERAD ASMA, MERAD SOUHEIB	Algeria, Algeria	Submission 349
52	Remaining Useful Life and Capacity Prediction via Machine Learning for Li-Ion Batteries	Ozan Kıyıkçı	Turkey	Submission 352
53	Radiation Shielding Performance of W-Containing CoCrFeNi High-Entropy Alloys: A Machine Learning and EPIXs Study	Sevda Saltik	Turkey	Submission 355
54	Nouvelles Benzimidazo[1,2-c]quinazolines et Indolo[2,3-b]quinoxalines : Analyse Structurale, Propriétés Antibactériennes	Houda Lamssane, Youssa Seqqat, Omar Abdellaoui, Mohamed Sattaih, Amal Haoudi, Ahmed Mazzah, Youssef Kandri Rodi, Khadija Moughamir	Morocco, Morocco, Morocco, Morocco, Morocco, France, Morocco, Morocco	Submission 359
55	Advances in Chemistry Studies: From Fundamental Research to Practical Applications	Mouna benbouda	Algeria	Submission 361
56	Emerging Trends in Modern Chemistry: Innovations and Applications	Mouna benbouda	Algeria	Submission 363
57	Investigation of the Cellular Uptake Mechanisms of Mesoporous Silica Drug Delivery Systems and Their Effects on Reactive Oxygen Species in Mouse Monocyte-Macrophage Cells	Elif Su Pektaş, Mukaddes Can, Pembegül Uyar ARPACI	Turkey, Turkey, Turkey	Submission 371
58	Nonlinear Numerical Modeling of Laterally Loaded Piles Embedded in Saturated Clays	Y.BAKHTAOUI, H.ZIOU	Algeria, Algeria	Submission 372
59	Aort Geometrisi Üzerinde Çoklu Yaş Grubu Viskozite Modellemesi ve HAD Analizi	Ahmet Çokyigit, Arif ÇUTAY, Özdeş Çermik	Turkey, Turkey, Turkey	Submission 373
60	Molecular Docking Insights for Enhanced Drug Delivery: A Flavonoid Inclusion Complex	BOULAHRAF Dhouha	Algeria	Submission 374
61	Parola Güvenliği için Kullanılan Hash Algoritmalarının Karşılaştırmalı Analizi	Zeynep Gül Aslan, Serdar Solak	Turkey, Turkey	Submission 377
62	Response Surface Methodology Optimization of Dye Decomposition over a Novel Heterogeneous Catalyst	Asma Bellaouar, Nacira Bellaouar, Fares Fenniche, Abdennour Serradj, RoumaissaMahdjoubi, Rebha Bellaouar	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Submission 380
63	Manyezit ve Genleştirilmiş Perlit Kullanılarak Üretilen Bims Blokların Performans İncelemesi	Orhan İLBOĞA, Servet YILDIZ, Alper Tunga ÖZGÜLER	Turkey, Turkey, Turkey	Submission 389
64	Invariant Formalism for the Paraquantum Generalized Harmonic Oscillator	M. Harrat, S. Allama	Algeria, Algeria	Submission 392
65	Fuel quality monitoring	Harche Rima, Laoufi Nadia Aicha	Algeria, Algeria	Submission 405
66	Fiber lazer makinalarında düşük hızlarda nozul tipinin kesim yüzeyine etkisi	Mustafa AKÇİL, Mehmet Ali KARACA	Turkey, Turkey	Submission 413
67	Comparative Analysis of PID and Artificial Neural Network-Based Controllers for Attitude Determination and Control in Spacecraft	Aşlı Durmuşoğlu	Turkey	Submission 414
68	Assessment of the impact of climate change on the competitiveness of agricultural and agro-industrial products in global markets	Urgenishbayev Anuarbek	Kazakhstan	Submission 416
69	Farklı Bifurkasyon Açılımlarına Sahip Dallanmalı Damar Yapılarında Kan Viskozitesinin Akış Dinamiğine Etkisi	Arif ÇUTAY, Hakan BAYRAKCI, Özdeş ÇERMİK, Muharrem İMAL	Turkey, Turkey, Turkey, Turkey, Turkey	Submission 421
70	Stability of some essential some essential spectra of the sum of two blocks of operators matrices via relatively Fredholm perturbations	Sana Bouzidi	Tunisia	Submission 424
71	Mapping Research Trends of fNIRS-Based Brain Tumor Studies: A Bibliometric Perspective	Mehmet Ümit AK	Turkey	Submission 431
72	Bash Tabanlı Bütünleşik Bir Otomatik Keşif Pipeline'ı ile Sızma Testlerinde Bilgi Toplama Sürecinin Otomasyonu	Tolga YILDIZ, Nazife Gizem AVCILAR, Erhan AKBAL	Turkey, Turkey, Turkey	Submission 432
73	Mathematical Modeling and the Historical Evolution of Interdisciplinary Research in the Natural Sciences	RAFIK Belghit, Mohamed Aounallah, Hicham Belghit, Chaima Belghit, SALAH AOUN, Nabti Nadjwa, MALKI RIMA	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Submission 439
74	Efficacy of drugs in the first, second and third-line therapy in patients with advanced hepatocellular carcinoma	Yusra Zarlashat, Bushra Munir, Wasim Abas, Abdul Ghaffar	Pakistan, Pakistan, Pakistan, Pakistan	Mail Submission 11
75	Influence of high content of limestone dust on the mechanical behavior of quarry sand mortars	Salah Labeled, Bouzidi Mezghiche	Algeria, Algeria	Mail Submission 12
76	Numerical Analysis of Mechanical Behaviour for a type III Hydrogen Pressure Vessel (15 MPa) Made of an Aluminum Liner and a Thick Carbon and Jute/Epoxy Composite	Maizia Abdelhakim, Habbar Ghania, Mohammed Bettayeb	Algeria, Algeria, Algeria	Mail Submission 13
77	Valorization of the antioxidant and antimicrobial activity of the leaves of Pistacia lentiscus L.	Asmaa Belgharbi- Allam, Nadia Chellichentouf, Mirvette Benyelles-Benfréha, Rym Nouria Benamara	Algeria, Algeria, Algeria, Algeria	Mail Submission 14

78	Monitoring vegetation, building and water variations in Tangier-Morocco from 2015 to 2022 using very high-resolution satellite images	F-E. Ezzaher, N. Ben Achhab, H. Naciri, N. Raissouni, A. Azyat	Morocco, Morocco, Morocco, Morocco, Morocco	Mail Submission 15
79	Minimum Cost/Trend Free Fractional Factorial Designs of Resolution IV	Ahlam GUIATNI	Algeria	Mail Submission 16
80	Impact of Humidity and Water Temperature on Alkali Reactive Concrete	Fouzia Bouabdallah, Houria Kherici-Bousnoubra, Mohamed Fouzi Habita	Algeria, Algeria, Algeria	Mail Submission 17
81	Effect of film thickness on the optical, structural and electrical properties of Fe doped SnO <sub>2</sub> thin layers prepared by spray pyrolysis with moving nozzle	CHEMSA Boudiaf, Boubaker Benhaoua, CHEMSA Ali, ALLAG Nassiba	Algeria, Algeria, Algeria, Algeria	Mail Submission 18
82	Optimal Design Of The Manipulator For Harvesting	SAOUD Inas, CHAHBOUN Asaad, RAISSOUNI Naoufal	Algeria, Algeria, Algeria	Mail Submission 19
83	Detection of adulteration of grape molasses by physicochemical parameter	S. Cherigui, I. Chikhi, H F. Dergal	Algeria, Algeria, Algeria	Mail Submission 20
84	The structural, electronic, magnetic, mechanical, and lattice dynamical properties of the novel full Heusler alloys Mn <sub>2</sub> HfX (X= Si and Ge). Ab-initio study	Mohamed Lamine BELKHIR, Benmalek Aida	Algeria, Algeria	Mail Submission 21
85	Degenerate Reaction-Diffusion Model with Nonlocal Dirichlet Boundary Condition and its Applications	Samiha Djemai, Salim Mesbahi	Algeria, Algeria	Mail Submission 22
86	Synthesis, Structural characterization, thermal stability and Biological Activities of a new proton-transfer material	Safaa Hidaoui, Mohammed Lachkar, Brahim El Bali	Morocco, Morocco, Morocco	Mail Submission 23
87	Comparison of Some Alternatives to the NTRU Cryptosystem	Eqbal Naji Hameed	Iraq	Mail Submission 24
88	On a Degenerate Reaction-Diffusion Model and its Applications	Salim Mesbahi, Samiha Djemai	Algeria, Algeria	Mail Submission 25
89	Sentinel-2 very high resolution satellite images from 2016 to 2022 to monitor and assess water sustainability in Padova-Italy	H. Naciri, N. Ben Achhab, F-E. Ezzaher, N. Raissouni, A. Azyat	Morocco, Morocco, Morocco, Morocco	Mail Submission 26
90	Wind-thermal economic dispatch problem with voltage stability enhancement using moth-flame optimization algorithm	Arif Bourzami, Mohammed Amroune, Abdelkader Boukaroura	Algeria, Algeria, Algeria	Mail Submission 27
91	Applying algorithm D.O.E optimization in spot welding process	Hamdani Nesrine, Mohammed Chaib, Abdelkader Slimane, Kaddour Bahram, Lebbal Habib, Abdelkader Ziadi, Boualem Noureddine	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 28
92	Numerical study of an energy approach to fatigue crack propagation under variable amplitude loading	Mohammed Chaib, Hamdani Nesrine, Ait kaci Djafar, Slimane Abdelkader, Boualem Noureddine, Adjeloua Abdelazi, Habib achache	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 29
93	Legume-grass associations under the effect of two water treatments in the semi-arid zone of Algeria	BOURAHLA Amel, CHENNAFI Houria	Algeria, Algeria	Mail Submission 30
94	Study and simulation of three models for estimation of solar radiations components	Ilyas ROUGAB, Ali CHEKNANE, Nabil ABOUCHABANA	Algeria, Algeria, Algeria	Mail Submission 31
95	Mass loss, Compressive strength and Ultrasonic pulse velocity of Concrete Produced with Waste Materials after Exposure to High Temperature	Mohammed Khattab, Samya Hachemi, Hicham Benzetta, Oday Jaradat	Algeria, Algeria, Algeria, Algeria	Mail Submission 32
96	Importance of Precursor Type in Fabrication ZnO Thin Films by Spray Pyrolysis For Photocatalytic Applications	Nassiba ALLAG, Chahinaz SIAD, Omar BEN MYA, Boudiaf CHEMSA	Algeria, Algeria, Algeria, Algeria	Mail Submission 33
97	Investigations of mechanical and thermoelectric properties of 'CoZrMnIn' novel half-Heusler alloy	Khadhraoui Zakaria, Amara Abdelaziz, Labidi Salima	Algeria, Algeria, Algeria	Mail Submission 34
98	Numerical simulation to study the horizontal homogeneity of the ABL by using CFD approach	Anas Sofi, Narjisse Amahjour, Abderrahman El kharrim	Morocco, Morocco, Morocco	Mail Submission 35
99	Towards a Based-GIS Urban Planning and Management Information System	Ikrame Abroun, Abdelilah Azyat, Nizar Ben Achhab, Naoufal Raissouni, Asaad Chahboun	Morocco, Morocco, Morocco, Morocco, Morocco	Mail Submission 36
100	The Turbine Inlet Temperature and The Fluid Flow Rate Effect on The Organic Rankine Cycle	Dhikra Derbal, Abderrezak Abdallah	Algeria, Algeria	Mail Submission 38
101	Structural, microstructural, and optical properties of Nickel doped tin oxide films by PSP method	Roguai Sabrina, Djelloul Abdelkader	Algeria, Algeria	Mail Submission 39
102	Crime and deviation detective, University of Annaba-Algeria The effect of socialization on the behavior of young offenders	Sahraoui Amara	Algeria	Mail Submission 40
103	Oxidative bromination in aqueous medium using copper and oxovanadium complexes	Boucekine Ikram, Kamel Ouari	Algeria, Algeria	Mail Submission 41
104	Complex Systems as a Unifying Framework	RAFIK Belghit, Mohamed Aounallah,	Algeria, Algeria,	Submission 440

	Across Mathematics, Natural Sciences, and History	Hicham Belghit, Chaima Belghit, SALAH AOUN, Nabti Nadjwa, MALKI RIMA	Algeria, Algeria, Algeria, Algeria, Algeria	
105	Oil Well Production Optimization Using Extended Reach Drilling (ERD) Technique	Younus Sameer, Maria Stoicescu, Timur Chis	Romania, Romania, Romania	Submission 459
106	Feasibility Study to Convert a highly deviated J-Shape well to Extended Reach Well ERD. A Torque and Drag analysis case	Younus Sameer, Maria Stoicescu, Timur Chis	Romania, Romania, Romania	Submission 460
107	Influence of Substrate Nature on the Properties of ZnO Thin Films	Chargui Fouzia	Algeria	Submission 466
108	Experimental Study of Corrosion Inhibition of Mild Steel in 0.5 M HCl by cyn3	Chibane Amina, Aliouane Nabila, Toukal Linda, Ait ahmed Nadia, Djedouani Amel	Algeria, Algeria, Algeria, Algeria, Algeria	Submission 468
109	Hydrogen Fuel Cells and Direct Reduced Iron (DRI): Toward Low-Carbon Energy and Sustainable Steelmaking	Abdelhakim Begar	Algeria	Submission 469
110	Investigation of Seismic Damages Due to Geotechnical Causes During The Kahramanmaraş Earthquakes, February 06, 2023	Burak Çakıl, Mutlu Şimşek, Ozan İnce, Ömer Faruk Taş	Turkey, Turkey, Turkey, Turkey	Submission 475
111	The Digital Economy and Its Challenges for Modern Economies	Hamza Goumri, Bilal Thameur	Algeria, Algeria	Submission 477
112	Biyometrik Karar Destek Sistemlerinde Yasal ve Etik Uyumluluk Aracı Olarak Açıklanabilir Yapay Zeka (XAI): GDPR Ekseninde Bir İnceleme	Ali Erdi CANDAR, Ömer YILMAZ	Turkey, Turkey	Submission 483
113	Kriyojenik Sıkıştırılmalı Hidrojen Depolama Tankının Isıl Analizi	Ozan Küçük, Eylem Yılmaz Ulu	Turkey, Turkey	Submission 489
114	Optimize Edilmiş Isı Alıcıda Eğimli ve Çoklu Çarpan Jetle Isı Transferinde Isı ve Akış Özelliklerinin Sayısal Analizi	Altuğ Karabey	Turkey	Submission 492
115	NATURE-INSPIRED FASTENERS: A COMPREHENSIVE REVIEW OF BIOMIMETIC TRIBOLOGY AND SUSTAINABLE APPLICATIONS IN THE AUTOMOTIVE INDUSTRY	Gökşan ŞAN	Turkey	Submission 499
116	Effects of Different Heat Treatment Conditions on Microstructure and Hardness of AISI 1040 and 5140 Steels	Salih Bilal Çetinkal, Gökhan Arıcı	Turkey, Turkey	Submission 501
117	NLP Tabanlı Kişisel Tıbbi Asistan Geliştirilmesi	Meliha ARSLAN, Özal YILDIRIM	Turkey, Turkey	Submission 507
118	Hygrothermal Aging Effects on Automotive Grade 3D Printed DLP Polymer Fasteners: A Material Degradation Study	Gökşan ŞAN	Turkey	Submission 508
119	Influence of Interfacial Geometry on Mechanical Retention and Flash Formation in Dual-Material Fasteners	Gökşan ŞAN	Turkey	Submission 509
120	Design Influence on IP54 Compliance of Polymer Fasteners in EV Power Distribution Units	Gökşan ŞAN	Turkey	Submission 512
121	THE USE OF DUAL-PHASE HIGH-STRENGTH (DP) STEELS (DP800 AND DP1000) IN AUTOMOTIVE BODY DESIGN: COMPARISON OF MECHANICAL PROPERTIES AND FORMABILITY	Yusuf Alptekin TÜRKKAN	Turkey	Submission 517
122	Biomass recovery by a hydrodeoxygenation reaction: DFT study and modelling	Neyla CHERIF BENMOUSSA, Redouane BACHIR, Roberto LINGUERRI, Sumeya BEDRANE, Wahiba BENDEDDOUCHE, Sihem AZIZI, Majdi HOCHLAF	Algeria, Algeria, France, Algeria, Algeria, Algeria, France	Submission 519
123	Numerical Modeling and Parametric Analysis of Reinforced Concrete Corbel strengthened with CFRP	Hiba Zaioune, Samy Mezhoud	Algeria, Algeria	Mail Submission 42
124	Multicomponent, Efficient Approach for the Synthesis of Pyrazolo[3,4-d]pyrimidine Derivatives Under Sonication	Racha Amira Benoune, Raouf Boulcina, Abdelmadjid Debache	Algeria, Algeria, Algeria	Mail Submission 43
125	Study of the finite-mass effects on some response functions for the system of the hadronic gas-quark gluon plasma phases coexisting in a finite volume	Rokaya Djida, Amal Ait El Djoudi, Hafida Ghobrini, Houda Mebdoua	Algeria, Algeria, Algeria, Algeria	Mail Submission 44
126	Influence of temperature in biodiesel production with homogeneous catalysis	Abdelhalim BALOULI, Tarek BERRAMA, Hayet TIZI	Algeria, Algeria, Algeria	Mail Submission 45
127	First principles predictions of structural, electronic and thermoelectric properties of half Heusler compound CrCaSn	M. Matougui, B. Bouademi, M.A.Kadaoui, S. Cherid, M. Houari, A.Zitouni, T. Lantri, S.Haid	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 46
128	LoRawan technologies for smart city	A. Karkouri, N. Ben Achhab, N.	Morocco, Morocco,	Mail

	applications: coverage evaluation and comparison for the 433MHz and 833MHz frequency bands	Raissouni, A. Chahboun	Morocco, Morocco	Submission 47
129	Perforated Baffles in Solar air collector	Mustapha Henaoui, KhaledAliane	Algeria, Algeria	Mail Submission 48
130	Two-phase flow in a Venturi flow-meter, a hydrodynamic experimental study	Ammar ZEGHLOUL, Lyes Nasserri, Zouhira HIRECHE	Algeria, Algeria, Algeria	Mail Submission 49
131	Large scale smart city planning based LoRawan: Propagation in situ measurement and two models comparison	A. Karkouri, N. Ben Achhab, N. Raissouni, A. Chahboun	Morocco, Morocco, Morocco, Morocco	Mail Submission 50
132	Measurement based evaluation for the packet delivery success rate for different LoRawan coverage levels	A. Karkouri, N. Ben Achhab, N. Raissouni, A. Chahboun	Morocco, Morocco, Morocco, Morocco	Mail Submission 51
133	Buckling analysis of nanocomposite beams based on refined beam theory by considering the Agglomeration effect of CNTs	Ihab Eddine Houalef, Ismail Bensaid, Ahmed Saimi	Algeria, Algeria, Algeria	Mail Submission 52
134	LoRaWan technology for Smart city: Speed impact on the packet delivery success rate	A. Karkouri, N. Ben Achhab, N. Raissouni, A. Chahboun	Morocco, Morocco, Morocco, Morocco	Mail Submission 53
135	Preparation and characterization of PVA/bentonite film for adsorption applications	BELKHODJA Abdelmajid, BELHOCINE Ryad, ABBOU Imane, GUENDOOUZ Souheyla, BENKHALED Amel, CHOUKCHOU-BRAHAM Esmâ	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 54
136	Evaluation of Adhesion and Moisture Susceptibility of Cotton Stalk Modified Bitumen	Adeel Iqbal, Sajjad Ahmad, Hafiz Ammar Zahid, Abid Latif, Muhammad Zahid	Pakistan, Pakistan, Pakistan, Pakistan, Pakistan	Mail Submission 55
137	Concentrate on Solar Gains to Improve the Thermal and Energy Efficiency of a Primary School Exposed to the Mediterranean Climate	Salah-Eddine JAOUAF, Bourassia BENSAAAD	Algeria, Algeria	Mail Submission 56
138	A FIRST ORDER DIFFERENTIAL EQUATION INVOLVING THE RIEMANN-LIOUVIL DERIVATIVE OF LINEAR VARIABLE ORDER	Hallouz Abdelhamid, Souid Mohammed Said	Algeria, Algeria	Mail Submission 57
139	Genetic algorithm based feature extraction for medical image classification	Fella Berrimi, Riadh Hedli, Chafia Karim-Mahamed	Algeria, Algeria, Algeria	Mail Submission 58
140	Study and analysis of the influence of the grading ring on the performance of a composite insulator using the response surface methodology	Khaled Belhouchet, Abderrahim Zemmit	Algeria, Algeria	Mail Submission 59
141	Effect of TiO <sub>2</sub> Coatings on the Electric Field Distribution of Outdoor High-Voltage Porcelain Insulators using AFM and FEM	Khaled Belhouchet, Abderrahim Zemmit	Algeria, Algeria	Mail Submission 60
142	Adsorption of methylene blue in water on magnetic bentonite/calcium alginate beads: contact time and effect of initial pollutant concentration	Abd Errahmane ZEMOURI, Embarek BENTOUHAMI	Algeria, Algeria	Mail Submission 61
143	Methylene blue removal by magnetic organophilic bentonite: effect of pH and initial concentration	Abd Errahmane ZEMOURI, Embarek BENTOUHAMI	Algeria, Algeria	Mail Submission 62
144	Study of adsorption properties of dyes on magnetic organophilic bentonite and magnetic organophilic bentonite beads	Abd Errahmane ZEMOURI, Embarek BENTOUHAMI	Algeria, Algeria	Mail Submission 63
145	Photodegradation of an antibiotic in the presence of a semiconductor: titanium dioxide (TiO <sub>2</sub> )	Abd Errahmane ZEMOURI, Embarek BENTOUHAMI	Algeria, Algeria	Mail Submission 64
146	Effect of Transition Metals on Electrical Properties of Zinc Phosphate Glass: DFT Study	Maghni Cherif, Kharroubi Mohamed	Algeria, Algeria	Mail Submission 65
147	Brain Tumor Segmentation Using Advance Medical Imaging Technique	Syed Muddusir Hussain, Tayaba Naz, Faraz Akram	Pakistan, Pakistan, Pakistan	Mail Submission 66
148	Android based Wearable device for Real Time Continuous ECG Monitoring via ESP-32	Tayaba Naz, Syed Muddusir Hussain, Faraz Akram	Pakistan, Pakistan, Pakistan	Mail Submission 68
149	One Boundary-Value Problem For Elliptic Differential-Operator Equations of The Second Order With Quadratic Spectral Parameter	Mohammed Rabah, Rabah Haoua	Algeria, Algeria	Mail Submission 70
150	The first ply failure analysis of laminated beam	Maroua Layachi, Abdelhak Khechai, Abderrahmane Ghrieb	Algeria, Algeria, Algeria	Mail Submission 71
151	Assessment of organic pollution of raw wastewater from Oued Ain-Sefra (Mostaganem)	KHELLADI Malika, MEZOUAGH Amina, MOHAMED SEGHIR Zahira, DEBAB Abdelkader	Algeria, Algeria, Algeria, Algeria	Mail Submission 192
152	Effect of DL-lactic acid on the Behavior of Starch/Microcrystalline Cellulose based Films	Djalila AOUI, Aicha SERIER	Algeria, Algeria	Mail Submission 193
153	A general decay result of a wave equation with a dynamic boundary control of diffusive type	Chahab Farida, Benkhedda Hanane, Benaissa Abbas	Algeria, Algeria, Algeria	Mail Submission 194
154	Physical properties of ZnO coatings deposited by spin-coating technique	T. Kacel, A. Boukerika, M.Hemmous	Algeria, Algeria, Algeria	Mail Submission 195
155	Study on the adsorption performance for heavy metals using activated carbons derived from agricultural waste	Mohamed Nadjib REBIZI	Algeria	Mail Submission 72

156	Applications of non-destructive testing and magnetic characterization to evaluate structural changing and corrosion behavior of duplex stainless steel aged at hot temperature	A.Ziouche, N.Boucherou, M.Mokhtari, A.Haddad, A.Hammouda, N.Zoubiri	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 73
157	The Impact of Socio-Cultural Dimensions on The Traditional Architecture of The Souf	Asma Femmam, Leila Sriti, Nadia Femmam	Algeria, Algeria, Algeria	Mail Submission 74
158	PHYTOCHEMICAL SCREENING AND BIOLOGICALS ACTIVITIES OF THE METHANOLIC EXTRACT OF THE MEDICINAL PLANT EPHEDRA ALATA ALENDA	DJAALALI Ilhem, GUEDRI Kamilia	Algeria, Algeria	Mail Submission 75
159	Coagulation flocculation process for leachate treatment	Kamilia MADI, Derradji CHEBLI, Sabiha HAMIDOUCHET	Algeria, Algeria, Algeria	Mail Submission 76
160	the influence of the fiber orientation and eccentricity ratio of the rectangular hole on the natural frequency of laminated plates	LAYACHI Safa, TATI Abdelouahab, Maroua LAYACHI	Algeria, Algeria, Algeria	Mail Submission 78
161	Influence of membrane load and fiber orientation on the natural frequency of laminated plates	Maroua Layachi, Abdelouahab Tati, Safa Layachi	Algeria, Algeria, Algeria	Mail Submission 79
162	Insight into Structural, Electronic, and Magnetic Properties of Full-Heusler Alloys Ir <sub>2</sub> VSn:Ab Initio Study	Hadjer Frioui, Athmane Meddour	Algeria, Algeria	Mail Submission 80
163	New Compound Poisson-Lindley distribution	Grine Razika	Algeria	Mail Submission 81
164	New hybrid composite with melamine and phosphorus.	LATOUI Mourad, AIT YOUCEF Hakima, BENGHANEM Fatiha	Algeria, Algeria, Algeria	Mail Submission 82
165	CONDENSATION, DESALINATION, AND WATER RECYCLING TO ENCOUNTER WATER STRESS	Rafika HELAIMIA	Algeria	Mail Submission 83
166	SMART AGRICULTURE AN EFFICIENT WAY TO PRESERVE PLANT RESOURCES	FERFAR Meriem, NARSIS Souad, DRIOUCHE Youssouf	Algeria, Algeria, Algeria	Mail Submission 84
167	Study and sizing of a fuel cell storage system fuel in a house	Chouitek Mama, Neddard Houaria	Algeria, Algeria	Mail Submission 85
168	Study of A Behavior in Path Drying Humidification of A Soil	SI AHMED Chabane, BOUZIDI Mohamed amin, OULED AMEUR Ahmed, Meziani Belkacem	Algeria, Algeria, Algeria, Algeria	Mail Submission 86
169	Effects of Jute Fiber on the Mechanical Properties of Concrete	Muhammad Sudais Khan, Shaheed Ullah	Pakistan, Pakistan	Mail Submission 87
170	Microstructural, thermal Stability and hyperfine properties of FeCo-2.5wt.%Ni powders prepared by high energy ball milling	M. Beldjehem, N. Bensebaa, S. Alleg, J.J. Sunol, J.M. Greneche	Algeria, Algeria, Algeria, Spain, France	Mail Submission 88
171	GIS based approach for the identification of recharge zones in spring catchments in the Indian Himalayan Region (IHR)	Syed Rouhullah Ali, Kireet Kumar	India, India	Mail Submission 89
172	Influence of Hf impurities doped on alkaline earth oxide CeO <sub>2</sub> on structural, electronic and optical properties: An ab-initio DFT study	Benmalek Aida, Doughmane Malika, Chettibi Sabah	Algeria, Algeria, Algeria	Mail Submission 90
173	Substitution of calcined bentonite from the decoloration of vegetable oils in cement	Ould Amer Ahmed, Bouzidi Mohamed Amin, Meziani Belkacem, Si Ahmed Chabane	Algeria, Algeria, Algeria, Algeria	Mail Submission 91
174	fuzzy logic control of a double star induction machine	Basma BENBOUYA, Hocine CHEGHIB	Algeria, Algeria	Mail Submission 92
175	Investigating postbuckling response of FG porous beams considering geometrical imperfections	Ismail Bensaid, Ahmed Saimi, Ihab Eddine Houalef	Algeria, Algeria, Algeria	Mail Submission 93
176	Antioxidant, enzyme inhibition and toxicology studies of methanol extracts of selected medicinal plants	Hiba Shahid, Syed Ali Raza Naqvi, Amjad Hussain, Syed Muhammad Rehan Hasan Shah Gilani, Naseem Abbas, Sadaf Ul-Hassan	Pakistan, Pakistan, Pakistan, Pakistan, Pakistan, Pakistan	Mail Submission 94
177	Development Of Technecium-99m Labeled Nanoparticles Loaded With Antimicrobial Agent As SPECT Imaging Agent	Vaneeza Javed, Syed Ali Raza Naqvi, Amjad Hussain, Syed Muhammad Rehan Hasan Shah Gilani, Naseem Abbas, Sadaf Ul-Hassan	Pakistan, Pakistan, Pakistan, Pakistan, Pakistan, Pakistan	Mail Submission 95
178	Application of vegetable oils in the field of food packaging	Hamour Noura, Boukerrrou Amar	Algeria, Algeria	Mail Submission 96
179	Real Time Ultrasoft Transverse gluons Self Energy at Next to-leading order in Hot QCD	Karima Bouakaz, Abdessamad Abada	Algeria, United Arab Emirates	Mail Submission 97
180	Impedance spectroscopy and dielectric properties of PZT-based ceramics	Messai Bahia, Makhloufi Rachid, Benmakhlof Aymen	Algeria, Algeria, Algeria	Mail Submission 98
181	High Antioxidant Capacities and Anti-inflammatory Effects of Hammada elegans Botsch. Extracts: An in vitro Assessment	Bensafiddine Feriha, Asseli Ibrahim, Djeridane Ammar, Yousfi Mohamed	Algeria, Algeria, Algeria, Algeria	Mail Submission 99
182	Synthesis and antibacterial activity of novel quinoline-oxirane hybrids	Bouria Houria, Alliouche Hayette, Oulmi Lamia, Belafaitah Ali	Algeria, Algeria, Algeria, Algeria	Mail Submission 100
183	ESTIMATE OF THE LIQUID DISCHARGE AND SOLID YIELD OF A SEMI ARID CLIMATE IN THE NORTHEAST ALGERIA	BADJI AMINA, MAROUF NADHIR, KECHIDA SAID	Algeria, Algeria, Algeria	Mail Submission 101

	(ELK'SOB WATERSHED CAS STUDY)			
184	On a Class of Sequential Fractional Differential Equations	Ahlem Adoui, Rabah Khaldi, Assia Guezane-Lakoud	Algeria, Algeria, Algeria	Mail Submission 102
185	CORMIX Simulations of Surface Brine Discharges: A Case Study	Abdelghani BOUTHIBA, Mourad AMITOUICHE, Hacem MAHMOUDI	Algeria, Algeria, Algeria	Mail Submission 103
186	Estimation of the compressive strength of self-compacting concrete using neural networks	Serikma Mourad, Mezidi Amar	Algeria, Algeria	Mail Submission 104
187	Numerical Study of air Flow Features Induced by a Room Ceiling-fan	Lyes Nasser, Zouhira Hireche, Ammar Zegloul, Djamel Eddine Ameziani	Algeria, Algeria, Algeria, Algeria	Mail Submission 105
188	Assessing the Impact of Key Performance Indicators on Moroccan Forests: A GIS and BI Analysis of the Tangier Province	Soukaina BAHMANE	Morocco	Mail Submission 106
189	An innovative nanoparticle for preparing pyrano[3,2-b]pyrone derivatives via a one-pot process	CHELIHI Ahmed, HASSAINE Ridha, BENABDALLAH Mohammed, BENDAHO Karima, NACHET Souad, TAIBI Nadia, CHOUCHEOU-BRAHAM Nouredine	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 107
190	Production and Characterization of Hydroxyapatite Nano powders prepared by Using Different Calcium Precursors	M. Mokhtari, A. Ziouche, H. Braa, H. Elmeslem	Algeria, Algeria, UAE, Morocco	Mail Submission 108
191	Study of the finite-mass effects on some response functions for the system of the hadronic gas-quark gluon plasma phases coexisting in a finite volume	Rokaya Djida, Amal Ait El Djoudi, Hafida Ghobrini, Houda Mebdoua	Algeria, Algeria, Algeria, Algeria	Mail Submission 109
192	Studying the Thermal Comfort of Displacement Ventilation in a Room : Inlet-Outlet Location Effect	Zouhira Hireche, Lyes Nasser, Ammar Zegloul	Algeria, Algeria, Algeria	Mail Submission 110
193	Encapsulation of Essential Oils natural allelochemicals compounds As bio herbicides products.- A Review	Soltane Sabrine, Benmeddour Tarek	Algeria, Algeria	Mail Submission 111
194	The traditional control of Brushless Doubly-Fed Reluctance Machines	Oualah Oussama, Kerdoun Djallel, Boumassata Abderraouf	Algeria, Algeria, Algeria	Mail Submission 112
195	Effect of recycled sand and fines retained from eggshell waste on the fresh and hardened properties and durability of SCC and SFSCC	Chaib Sihem, Bensalem Rania	Algeria, Algeria	Mail Submission 113
196	Eco-Sustainability and Green Metrics for Measuring the Big Data Systems Performance	Yusmadi Yah Jusoh, Aishwharya Raani Arunachalam, Rusli Abdullah, Rozi Nor Haizan Nor, Shireen Muhammad	Malaysia, Malaysia, Malaysia, Malaysia, Malaysia	Mail Submission 114
197	Identification of a photo-degradation by-products of a organophosphorus pesticide at trace level	ZEKKAOUI Chemseddine, BERRAMA Tarek, DADOU Salima, BERIBER Assia, DOUFENE Nassime, Kadmi Yassine	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 115
198	Carbon Footprint of Desalination Plants in Algeria	Baloul Hakim, Amitouche Mourad	Algeria, Algeria	Mail Submission 116
199	An AI-based Android Application for early diagnosis of Ocular Diseases	Abdul Malik Muhammad, Muddasir hussain, Tayaba Naz, Faraz Akram	Pakistan, Pakistan, Pakistan, Pakistan	Mail Submission 117
200	Application of the 2-D Continuous Wavelet Transform using Directional Wavelet	Kenza Zaibak, Nora Nait Bouda, Fawzia Mekideche-Chafa	Algeria, Algeria, Algeria	Mail Submission 118
201	AUTOMATED MODEL-BASED TEST CASE GENERATION USING UML ACTIVITY DIAGRAM: A REVIEW	Rozi Nor Haizan Nor, Mohd Abdul, Monim, Yusmadi Yah , Jusoh	Malaysia, Malaysia, Malaysia	Mail Submission 119
202	Development of TQI- RI Correlation on Track Degradation Technique Using Numerical Method	Shanmugasekar Thenappan, Azlan Adnan	Malaysia, Malaysia	Mail Submission 120
203	COI GENE BASED PHYLOGENETIC STUDIES OF ALAUDIDAE (PASSERIFORMES) FROM PAKISTAN	Fakhra Nazir, Fakhra I Abbas, Sahar Fazal	Pakistan, Pakistan, Pakistan	Mail Submission 121
204	Reduction of Harmonics in three-phase machine drive via the Selective Harmonic Elimination Methods	Rabiah Houli, Mohamed Yacine Hammoudi, Abdennacer Titaouine	Algeria, Algeria, Algeria	Mail Submission 122
205	In silico Investigation of several series of heterocyclic molecules for drug discovery	Chennai Yassmine, Belaidi Salah	Algeria, Algeria	Mail Submission 123
206	Ageing of Rotating Equipment Machines in Harsh Environment	Aiyad Gannan	Qatar	Mail Submission 124
207	Analysis for flow an incompressible fluid with friction	LAHLAH Taklit Hana	Algeria	Mail Submission 125
208	Electrochemical sensors are electronic devices used to measure and detect specific substances	Roumaissa LAIEB, Ilhem GHODBANE, Saida ZOUGAR	Algeria, Algeria, Algeria	Mail Submission 126
209	Sustainable 3D Printing with Palm Fiber-Reinforced Composites	Hocine Heraiz, Salah Amroune, Khalissa Saada, Riyadh Benyettou	China, Algeria, Algeria, Algeria	Mail Submission 127
210	Comprehensive First-Principles Investigation of the Electronic, Optical, Mechanical, and Thermoelectric Properties of $\alpha$ -Graphyne	R. Masrou	Morocco	Mail Submission 128
211	First-Principles Investigation of Structural, Electronic, Thermoelectric, and Photovoltaic Properties of $Y_2C$ (Y = Si, Ge, Sn) Monolayers	R. Masrou	Morocco	Mail Submission 129
212	First-Principles Investigation of Electronic, Magnetic, Mechanical, Phonon, and	R. Masrou	Morocco	Mail Submission 130

	Thermoelectric Properties of Fe-Hf-Zr-B-Cu Alloys			
213	The potential role of halophytic nanoparticles to improve plant growth and salinity resilience	Neelma Munir, Maria Hanif, Zainul Abideen	Pakistan, Pakistan, Pakistan	Mail Submission 131
214	Low-Latency Communication System for Time-Sensitive IoT Applications	Immanuel Prabaharan S, R Deivanayaki, Aswini M, S Muthurajan	India, India, India, India	Mail Submission 132
215	Quasistatic electro-viscoelastic problem and its asymptotic behavior	Abderrahmane Mihoub, Mourad Dilmi, Hamid Benseridi	Algeria, Algeria, Algeria	Mail Submission 133
216	differential equations of elliptic type with an abstract Robin boundary condition containing two spectral parameters study in a Hölder space: non commutative framework	Mohammed Rabah, Rabah Haoua	Algeria, Algeria	Mail Submission 134
217	ANTIMICROBIAL ACTIVITY OF ALGERIAN MEDICINAL PLANT	Khaoula Menaiaia, Fadila Khaldi, Amina Ouahab	Algeria, Algeria, Algeria	Mail Submission 135
218	Double - diffusive natural convection in a tilted square cavity submitted to cross gradients of temperature and concentration	Nesrine Rachedi, Messaoud Guellal	Algeria, Algeria	Mail Submission 136
219	Some Parabolic Equations and Application in Image Restoration	Abir Bounaama, Fatima Zohra Zeghibib, Messaoud Maouni	Algeria, Algeria, Algeria	Mail Submission 137
220	On Some Generalized Hilfer Fractional Differential Coupled Systems with Infinite Delay	Abdelkrim Salim	Algeria	Mail Submission 138
221	Existence and multiplicity for positive solutions of a system of first order differential equations with multipoint and integral boundary conditions On time scale	Ibtissem Daira, Malek Abdelali, Ahmed Ayoub.boukelia, Isra Nada	Algeria, Algeria, Algeria, Algeria	Mail Submission 139
222	High-efficiency and environmentally friendly thermoelectric material: full Heusler Ba <sub>2</sub> AgBi alloy	M. Matougui, B. Bouadjemi, T. Lantri, M. Houari, A.Zitouni, S.Haid, M.A. kadaoui	Algeria, Algeria, Algeria, Algeria	Mail Submission 140
223	AB initio calculation of electronic and magnetic structures properties of TaIrCo compound	Addou Oussama, Touia Amina	Algeria, Algeria	Mail Submission 141
224	Removal of Carmine Cochineal food dye from aqueous media by adsorption on peanut shells	Atef Ali Ahmed, Rayane Diaf, Zhou Hattab, Yamina Berredjem	Algeria, Algeria, Algeria, Algeria	Mail Submission 196
225	Synthesis of Graphitic Nitride modified Maghnite Clay Catalyst for Efficient Dye Degradation via Impregnation Calcination Method	MEKIDICHE Mounir, MEKIDICHE Bouchra, KHALDI Khadidja	Algeria, Algeria, Algeria	Mail Submission 142
226	The thiazolidinone molecule's performance and examination of its nonlinear properties	Fatima Zohra Boudjenane, Nourdine Boukabcha, Nassima Bourahla, Ahmed Abdelmoula, Abdelkader Chouaih	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 143
227	The investigation of layered double hydroxide using XRD and FTIR	Fatima Zohra Boudjenane, Nourdine Boukabcha, Nassima Bourahla, Ahmed Abdelmoula, Abdelkader Chouaih	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 144
228	The NLO characteristics of push-pull coordination compound	Fatima Zohra Boudjenane, Nourdine Boukabcha, Nassima Bourahla, Ahmed Abdelmoula, Abdelkader Chouaih	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 145
229	Renewable energy hardening of concretes for maritime structures and its effect on mechanical performance	Ben Ammar Ben Khadda	Algeria	Mail Submission 146
230	The optoelectronic properties of novel Lithium tetrafluoroaurate material LiAuF <sub>4</sub> : First-principles calculations	Ishak Mebarkia	Algeria	Mail Submission 147
231	BETA CELL DAMAGE AND DIABTES INDUCED BY STREPTOZOTOCIN IN WISTAR RATS AND THE EFFECT OF NADH ADMINISTRATION	Abdellatif Amina, SLAMA Nada, Bahria Karima, Dahman Oukrif, BIRKMAYER George, Oumouna Mustapha, Benachour Karine	Algeria, Algeria, Algeria, UK., Austria, Algeria, Algeria	Mail Submission 148
232	Preparation and characterization of graphene oxide-polypyrrole nanosheets composite hybrid	Leila Lamiri, Ouafia Belgherbi, Boussaha Bouchoul, Katib Hamlaoui, Mouhamed Hamidouche, Assia Tounsi, Radhia Khouatra	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 149
233	Study and Simulation of a Single-Phase Uncontrolled Rectifier Based on PFC System for Power quality Enhancement	Oualid Aissa, Abderrahim Reffas, Hicham Talhaoui	Algeria, Algeria, Algeria	Mail Submission 150
234	Improved Variational Mode Decomposition and Teager Energy Operator for Bearing Fault Diagnosis	Yahia Bouseloub, Ali Belhamra, Raid abdmeziene, Nadir Benamira	Algeria, Algeria, Algeria, Algeria	Mail Submission 151
235	High Antioxidant Capacities and Anti-inflammatory Effects of Hammada elegans Botsch. Extracts: An in vitro Assessment	Feriha Bensafiddine, Ibrahim Asseli, Ammar Djeridane, Mohammed Yousfi	Algeria, Algeria, Algeria, Algeria	Mail Submission 152
236	A Review on Thermal Insulation of Materials for Energy Efficiency of Buildings	Talha Fahim Awan, Haider Abbas, Usman Hussain	Pakistan, Pakistan, Pakistan	Mail Submission 153
237	Nylosan Red textile dye elimination by adsorption process: RSM validation	Amel BELAYACHI-HADDAD, Nouredine BENDERDOUCHE, Benaouda BESTANI, Chérif HADDAD	Algeria, Algeria, Algeria, Algeria	Mail Submission 154
238	Securing Communications in Robot Operating System	JAAFARI HATIM, CHAHBOUN Asaad, RAISSOUNI Naoufal	Morocco, Morocco, Morocco	Mail Submission 155

239	X-ray diffraction, magnetic and thermal studies of the mechanically alloyed Fe-Co-Ni powders	N. Bensebaa, M. Beldjehem, S. Alleg, J.J. Sunol	Algeria, Algeria, Algeria, Spain	Mail Submission 156
240	Visible Light Communication and Li-Fi Technology for Audio Transmission	ABDELMOULA Ahmed, L'ANTRI Ibrahim, DEHACHE Kawther	Algeria, Algeria, Algeria	Mail Submission 157
241	Limited Laboratory Environment for the Use of Optical Methods for Audio Signal Transmission	ABDELMOULA Ahmed, L'ANTRI Ibrahim, DEHACHE Kawther	Algeria, Algeria, Algeria	Mail Submission 158
242	Design of an Indoor Visible Light Communication Link for an Audio Transmission System	ABDELMOULA Ahmed, L'ANTRI Ibrahim, DEHACHE Kawther	Algeria, Algeria, Algeria	Mail Submission 159
243	Audio Processing for Visible Light Communication From Sound to light	ABDELMOULA Ahmed, L'ANTRI Ibrahim, DEHACHE Kawther	Algeria, Algeria, Algeria	Mail Submission 160
244	A Sound Transmission System Based on Visible Light Communication	ABDELMOULA Ahmed, L'ANTRI Ibrahim, DEHACHE Kawther	Algeria, Algeria, Algeria	Mail Submission 161
245	Synthesis the biocomposite Cellulose/Zinc oxide Nanocomposite ( CNC/ZnO NPs )	TEREA Hafidha, SELLOUM Djamel, REBAI Abdelkerim	Algeria, Algeria, Algeria	Mail Submission 162
246	New ternary cement combinations from Algerian renewable raw materials to reduce acid attack	Abdelkadir Belghit, Nasr Eddine Bouhamou, Sid Ahmed Bekhti, Sallai Hind Hidayet, Belkacem Ziregue	Algeria, Algeria, Algeria, Algeria	Mail Submission 163
247	Relationship between density and thermal properties of lightweight blocks made with raw earth stabilized and incorporating expanded polystyrene EPS beads	Safa Layachi, Bachir Taallah, Ouarda Izemmourena, Maroua Layachi, Abdelhamid Guettala	Algeria, Algeria, Algeria, Algeria	Mail Submission 164
248	Classification of Mammography Images using Bag of Features Model	Sarah Benmazou	Algeria	Mail Submission 165
249	Ultrasound physical modification of activated carbon from hydrogen peroxide : An optimization study on removal of cationic dye	Mourad Termoul, Salima Attouti, Mokhtar Benzekri Benallou, Anissa zerhouni, Zohra Mekibes, Nourddine Benderdouche, Benaouda Bestani	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 166
250	On the Importance of Photocatalytic degradation to remove the Basic Dye 46 under UV Radiation	Amel Hamadi, Hiba Kais, Nacera Yeddou-Mezennere, Zohra Bensaadi	Algeria, Algeria, Algeria, Algeria	Mail Submission 167
251	First-principles phonon and Boltzmann calculations for a new semiconductor full Heusler Li <sub>2</sub> BeX	Houari Mohammed, Bouadjemi Bouabdellah, Mesbah Smain, Lantri Tayeb, Matougui Mohamed, Akham Amel, Bentata Samir	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 168
252	High absorption coefficient in full heusler compounds, insight into the optical properties of Li <sub>2</sub> CaC and Li <sub>2</sub> SrC	Mesbah Smain, Houari Mohammed, Lantri Tayeb, Bouadjemi Bouabdellah, Akham Amel, Zitouni Ali, Haid Slimane	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 169
253	Improvement of optical and photoelectrochemical properties of manganese oxide by incorporation of graphene nanoparticles	Assia Tounsi, Leila Lamiri, Noudjoud Houas, Farid HABELHAMES, Ahmed BAHLOUL	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 170
254	Facile Synthesis of Ferns-Like PbTh-silver as Binder-Free Faradic Electrodes for Supercapacitors with Improved Electrochemical Properties	Assia Tounsi, Leila Lamiri, Noudjoud Houas, Farid HABELHAMES, Ahmed BAHLOUL	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 171
255	Optical Properties and FTIR Studies of MnO <sub>2</sub> Doped Graphene Nanoparticles by Simple electrodeposition Method	Assia Tounsi, Leila Lamiri, Noudjoud Houas, Farid HABELHAMES, Ahmed BAHLOUL	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 172
256	Structural, elastic, and electronic properties of LiAlSi Half-Heusler compound under hydrostatic pressure	K. Djennane, N. Dehimi, M. Dehbaoui	Algeria, Algeria, Algeria	Mail Submission 173
257	Electro-Synthesis, characterization and capacitive performance of FTO/Polybithiophene- Ag composite	Assia Tounsi, Leila Lamiri, Noudjoud Houas, Farid HABELHAMES, Ahmed BAHLOUL	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 174
258	Ab-initio Investigation of Structural, Electronic and Elastic Properties of New Heusler alloys CoMSn (M=Ru,Y)	S. Sefir, S.Terkhi, N. Mehtougui, A.Zitouni, Z.Aziz, B.Bouadjemi	Algeria, Algeria, Algeria, Algeria	Mail Submission 175
259	Preparation, characterization and mechanical testing of chitosan/TiO <sub>2</sub> film nanocomposite	Debaa soumia, bouzid Khadidja, Khane Yasmina, Hafsi Zoulikha, Chaibi Wahiba	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 176
260	Preparation, characterization and application of PbS/ZnO thin films	Fekhar Ahmed Moncef, Babenette Lokman, Djaber Aouf, Fenniche Fares, Khane Yasmina	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 177
261	Biosynthesis, characterization and application of cuprous oxide Cu <sub>2</sub> O nanoparticles	Gagi Abdelkrim, Laib Marawa, Khane Yasmina, Hafsi Zoulikha, Hadjomar Zineb	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 178
262	Alginate/polyaniline/graphene hydrogel nanocomposite: preparation, characterization and application	Djelloude Souhila, Akif Hadil, Fenniche Fares, Djaber Aouf, Khane Yasmina	Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 179
263	Development of a dressing based on Alginate/ZnO bionanocomposite film for medical treatment	Benoudina Imene, Amieur Firouz, Khane Yasmina, Kesbi Brhim	Algeria, Algeria, Algeria, Algeria	Mail Submission 180
264	Identification of molecules from culinary	Addou Hadjer, Bouchentouf Salim,	Algeria, Algeria,	Mail

	traditions North Africans with androgen receptor inhibitory effect for the prevention and treatment of prostate cancer	Laouedj Nadjia, Bouhella Fadhila, Elaziouti Abdelkader	Algeria, Algeria, Algeria	Submission 181
265	Study of thermal and mechanical properties of poly (lactic acid)-hydroxyapatite composites	NedjmaTazibt, Mustapha Kaci, Nadjet Dehouche	Algeria, Algeria, Algeria	Mail Submission 182
266	HIGH TEMPERATURE BEHAVIOR ON THE PROPERTIES OF FIBER CONCRETE	Redha Benali, Tarek Mansouri, Rafik Boufarh	Algeria, Algeria, Algeria	Mail Submission 183
267	Electrochemical determination of thermodynamic parameters of Dysprosium system in molten LiF-CaF <sub>2</sub>	Abdelkader Saila	Algeria	Mail Submission 184
268	Smart energy management algorithm for load dispatching based on renewables energies forecasting of grid-connected micro-grid	KHEITER Amel, SOUAG Slimane, LARBI Arezki	Algeria, Algeria, Algeria	Mail Submission 185
269	Optimization of an internal combustion engine	Mounira Derfoul, Bachir Merzoug, Ahmed Assala, Samira Tlili	Algeria, Algeria, Algeria, Algeria	Mail Submission 186
270	Experimental and theoretical study of polyphenols extracted from Syzygium aromaticum as corrosion inhibitors	Hana Ferkous, Amel Delimi, Kahlouche Abdesalem, amdjed abdenouri, Chérifa Boulechfar, Meriem Gabsi	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 187
271	Contribution to the corrosion inhibition of Coper in 1 M HCl by Aloe Vera Gel extract. Experimental and theoretical studies	Amel Delimi, Hana Ferkous, Chérifa Boulechfar, Kahlouche Abdesalem, Amdjed Abdenouri, Meriem Gabsi, Boussaha Elhadi, Aouici Samia	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 188
272	Biodiesel production from cotton seed oil Gossypium arboreum	OULED BRAHIM Sabrina, HAMEL Marwa Lamise, khane Yasmina, BABA ARBI Ilias	Algeria, Algeria, Algeria, Algeria	Mail Submission 189
273	Synthesis, Spectroscopic and Theoretical Investigation of A Novel Thiazolidin-4-one Derivative	Mohammed Hadj Mortada Belhachemi, Zohra Douaa Benyahlou, Amine Ould Rabah, Kheira Hammou, Nouridine Boukabcha, Abdelkader Chouaih	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 190
274	Laser Signal Processing Coded by the Wavelet Transform Its Application in Protection Systems	Brahim Meriane, Salah Rahmouni, Issam tifouti	Algeria, Algeria, Algeria	Mail Submission 191
275	Effect of food on adult bean weevil Bruchus rufimanus longevity and impact of this pest on the host plant Vicia faba L. seeds germination	Medjdoub-Bensaad Ferroudja, Lakabi Lynda, Ramdini Ramdane	Algeria, Algeria, Algeria	Mail Submission 3
276	Evaluation of the effectiveness of medicinal plants ephedra alata alenda against neurotoxicity of fenthion	Ilhem DJAALALI, Kamilia GUEDRI	Algeria, Algeria	Mail Submission 37
277	Numerical investigation of Catalytic Combustion of Methane Using Wall Surface Reactions	Abdelkder Mahammedi, Naas Toufik Tayeb, TELHA Mostefa	Algeria, Algeria, Algeria	Mail Submission 67
278	Hydrodynamic performances of a Chaotic Micromixer to enhance mixing characteristics	Naas Toufik Tayeb, Abdelkder Mahammedi, TELHA Mostefa	Algeria, Algeria, Algeria	Mail Submission 69
279	Experimental spectral characterization, Hirshfeld surface analysis, DFT calculations studies of (2Z,5Z)-5-(4-nitrobenzylidene)-3-N(2-methoxyphenyl)-2-N'(2-methoxyphenylimino) thiazolidin-4-one	Kheira HAMMOU, Mohammed Hadj Mortada BELHACHEMI, Zohra Douaa BENYAHLOU, Amine OULD RABAH	Algeria, Algeria, Algeria, Algeria	Mail Submission 197
280	Gas Separation by Hollow Fiber Membrane	Mezouagh Amina, Khaladi Malika, Mohamed Seghir Zahira, Absar Belkacem	Algeria, Algeria, Algeria, Algeria	Mail Submission 198
281	Minimum Cost/Trend Free Fractional Factorial Designs of Resolution IV	Ahlam GUIATNI	Algeria	Mail Submission 199
282	Short-term monitoring and analysis of halophytes vegetation in arid steppe of South-east Algeria (Biskra)	Amina BELHADJ, Fatma DEMNATI, Nouar BOULGHOBRA	Algeria, Algeria, Algeria	Mail Submission 200
283	Use of coagulation-flocculation process for the treatment of the treatment of real tannery wastewater from Fes city (Morocco)	Oumaima Bahammou, Hamza Bellouk, Imane El Mrabet, Karim Tanji, Fouad Khalil, Hicham Zaitan	Morocco, Morocco, Morocco, Morocco, Morocco, Morocco	Mail Submission 201
284	The role of Zn/Ni ratio on dielectric properties in Na <sub>2</sub> Zn <sub>1-x</sub> NixP <sub>2</sub> O <sub>7</sub> glass	Cherif MAGHNI, Mohamed KHRROUBI, Chouaieb ZAOUCHE	Algeria, Algeria, Algeria	Mail Submission 202
285	Oxidative and inflammatory stress - counteracting with nutritional antioxidants	Elena Daskalova	Bulgaria	Submission 235
286	Integrated management and prevention of Aedes mosquitoes through plant extracts along with insecticides	Shabab Nasir	Pakistan	Submission 375
287	Adsorptive Removal of Textile Dyes Using Phosphoric Acid-Activated Biochar Derived from Rice Husk	DJEMMALI Badreddine, DAHDOUH Nadjib, HAFSA Haroun, CHAABANE Toufik, FERNANDES Annabel	Algeria, Algeria, Algeria, Algeria, Algeria	Submission 388
288	Growth and production of Capsicum annum pepper after inoculation with Meloidogyne spp	Yaici Melha, Ramdini Ramdane, Medjdoub-Bensaad Ferroudja	Algeria, Algeria, Algeria	Submission 395
289	Food as a Modulator of Epigenetic Mechanisms of Aging: Focus on the Role of Polyphenols	Elena Daskalova	Bulgaria	Submission 396
290	A Five-Slab Classification of Sensitive Information, which the Scientists and the Employees of SPD Organizations Come Across — Handling, Dissemination and	Syed Arif Kamal	Pakistan	Submission 404

Page No	Title	Authors	Country	Submission ID
291	Processing CURRENT ISSUES IN THE COMPLIANCE PROCEDURES "KNOW YOUR CUSTOMER" (KYC) IN FINANCIAL INTERMEDIARIES	Stanislava Petrova	Bulgaria	Submission 502
292	Transient Heat Transfer Analysis in Fuel Cell Plates Using a Nodal Network Approach	Hüseyin Kahraman	Turkey	Submission 354
293	Energy Balance Analysis of Layered Structures in Proton Exchange Membrane Fuel Cells	Hüseyin Kahraman	Turkey	Submission 368
294	Phytochemical screening and evaluation of antioxidant activity of <i>Inula viscisa</i> 's leaves extract	Nadjet AZZI, Nour El Houda BELABAS, Younes DOUFFA, Haifaa LAROU, Thoraya GUEMMAZ, Fatima ZERARGUI, Karima SAFFIDINE, Abderrahmane BAGHIANI	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 203
295	Thermal degradation study of polyacrylic acid by microcalorimetric measurements	Naziha Bensahla, Zoubir Benmaammar	Algeria, Algeria	Mail Submission 204
296	Investigating the Antifungal and Antioxidant Efficacy of Essential Oils and Their Major Compounds	Lamyae Et-tazy, Abdeslam Lamiri, Laila Satia, Mohamed Essahli, Sanae Krimi Bencheqroun	Morocco, Morocco, Morocco, Morocco, Morocco	Mail Submission 205
297	Computer-assisted optimization process for environmental dye treatment in wastewater	Amel BELAYACHI-HADDAD, Nouredine BENDERDOUCHE, Benaouda BESTANI, Cherif HADDAD	Algeria, Algeria, Algeria, Algeria	Mail Submission 206
298	Exploration of Natural Fiber Processing Techniques for Bio-based Building Materials Applications: A Review	Adel Baghdad Zougar, Ahmed Soufiane Benosman, Farid Brahim Houti, Abdelmadjid Lasledj, Imane Fatima Zohra Mesli, Abdelhak Badache	Algeria, Algeria, Algeria, Algeria, Algeria, Algeria	Mail Submission 207
299	Data Analysis of Moroccan Secondary School From 2004 to 2021: Case Tangier Tetoun Al Houceima Region	Bayad Fouzia, Azyat Abdelilah, Ben Achhab Nizar, Raissouni Naoufal	Morocco, Morocco, Morocco, Morocco	Mail Submission 77
300	Artificial Intelligence and the New Culture Industry: A Frankfurt School Critical Analysis	Burçe Akcan, Merve Gençyürek-Erdoğan	Turkey, Turkey	Submission 322
301	Financial Resilience of the Insurance Sector in the Post-Pandemic Era: A Fundamental Analysis Approach	İbrahim Karaaslan, Ayşegül Karadavut	Turkey, Turkey	Submission 461
302	A Bibliometric Analysis of Research Trends on the Impact of Corporate ESG Scores on Financial Performance	İbrahim Karaaslan, Ayşegül Karadavut	Turkey, Turkey	Submission 462
303	Multi-Layer Diabetic Footwear with Patient-Specific Off-Loading: A Cost-Effective Solution for Ulcer Management and Prevention	Levent Aydin	Turkey	Submission 521
<b>Content of Full Papers</b>				
1-8	Erişkin Kök Hücreler ve Genel Özellikleri	Serife Tutuncu	Turkey	Mail Submission 1
9-16	GWJ E-Assistant Dışli Programı ile Dışli Tasarımı	Mustafa Timur	Turkey	Mail Submission 2
17-21	Adana'nın Termal ve Hidrolojik Göstergelerinde Uzun Süreli Eğilimlerin İstatistiksel İncelenmesi	Gökmen Çeribaşı, Ahmet İyad Ceyhunlu	Turkey, Turkey	Submission 218
22-32	Ticari Olarak Satılan Çuha Çiçeği Yağı Ürünlerinde Bulunan Element İçeriklerinin ICP-OES İle Tayini	Yasemin Türeyen, Ayça Karasakal	Turkey, Turkey	Submission 222
33-37	Taze Meyve ve Sebzelerde Hasat Sonrası Kaliteyi Koruma Yöntemleri: Mevcut İşlemler ve Yeni Teknolojiler	Şeyda ÇAVUŞOĞLU, Fırat İŞLEK	Turkey, Turkey	Submission 227
38-44	Anomaly Detection using Variational Autoencoders and LSTM Networks	Bilal Şenol	Turkey	Submission 228
45-50	Diurnal Variation and Fresh-Dry Leaf Differences in the Essential Oil Yield and Composition of <i>Laurus nobilis</i> L.	Musa Türkmen, Hasan Maral, Yılmaz Eren	Turkey, Turkey, Turkey	Submission 230
51-56	Impact of Drying Temperature on Essential Oil Yield and Chemical Composition of <i>Rosmarinus officinalis</i> L.	Musa Türkmen, Hasan Maral, Yılmaz Eren	Turkey, Turkey, Turkey	Submission 231
57-62	İklim Göçü, Uluslararası Hukukun Koruma Açığı ve Güvenleştirme: Belirsizlikler ve Etkiler	Ömer UĞUR, Emre CENGİZ, Metin AKSOY	Turkey, Turkey, Turkey	Submission 237
63-68	Avrupa Birliği Dış Politikasında Liderlik Sorunu	Ömer UĞUR, Metin AKSOY, Emre CENGİZ	Turkey, Turkey, Turkey	Submission 238
69-78	Kriz Anında Otonom Veri İşleme: Google Antigravity Platformunun Sosyal Medya Veri Analizinde Kullanımı	Akif KARATAŞ, Mehmet Cabir AKKOYUNLU	Turkey, Turkey	Submission 240
79-83	Effects of Printing Orientation on the Tensile Strength of ABS Products Manufactured by the FDM Method	ÇERLEK, Ömer	Turkey	Submission 241
84-90	Reklamda Kaygı, Duyular ve Toplumsal	Merve ERSAN, Harika Bahar ÖZTOK	Turkey, Turkey	Submission 242

	Cinsiyetin İnşası: Göstergibilimsel Bir Okuma			
91-95	Comparing Performance Analyses for Different Numbers of Users in MIMO-CDMA Systems	Rüstem YILMAZEL	Turkey	Submission 244
96-100	Hasat sonrası Meyve ve Sebzelerin Kalite Kontrollerinde Yenilikçi Tahribatsız Yöntemler	Şeyda ÇAVUŞOĞLU, Fırat İŞLEK	Turkey, Turkey	Submission 249
101-106	Makine Öğrenmesi Modelleri ile Hastalık Sınıflandırması: Çoklu Model Karşılaştırması	Doğan DEMİR, Yahya Doğan, Cüneyt ÖZDEMİR	Turkey, Turkey, Turkey	Submission 254
107-114	A ViT-CNN Hybrid Model for Enhanced Multiclass Brain Tumor Diagnosis from MRI Scans	Emre YÜKSEK, Kemal ADEM	Turkey, Turkey	Submission 255
115-119	Comparative Evaluation of Radiopacity in Hydroxyapatite- and Barium-Modified PLA Composites for CT Phantom Applications	Yahya ZOURI, Özkan ÖZMENİ Mehmet DOĞAN	Turkey, Turkey, Turkey	Submission 256
120-122	Ethical and Governance Challenges of AI-Based Decision Support Systems: A Multi-Sector Review	Kadir KESGİN	Turkey	Submission 263
123-128	Gender Bias in AI-Powered Graphic Design	Merve ERSAN	Turkey	Submission 264
129-133	GRAFİK TASARIMDA KAPSAYICILIK SORUNLARI: KURAMSAL BİR ÇERÇEVE	Birsen Çeken	Turkey	Submission 265
134-143	Elektrikli Araç Telemetri Verilerinin Makine Öğrenmesi Yöntemleri ile Sınıflandırılması	Muhammed Yusuf KAYA, Cüneyt ÖZDEMİR, Yahya DOĞAN	Turkey, Turkey, Turkey	Submission 267
144-149	Kuerstin ve Resveratrolün Keap1-Nrf2 Yolağına Yönelik Bağlanma Potansiyelinin Moleküler Kenetlenme ile İncelenmesi	Bülent Dede	Turkey	Submission 269
150-153	An Approach to Increasing Nonlinearity Value of Random Selection Based S-box Structures Using Genetic Crossover	Fırat Artuğer, Gürkan Doğan	Turkey, Turkey	Submission 270
154-157	DEĞİŞKEN KESİTLİ HOMOJEN BİR PLAĞIN TERMAL BURKULMA ANALİZİNİN RİTZ YÖNTEMİ İLE ÇÖZÜMÜ	Turan Yazar, Şeref D. Akbaş	Turkey, Turkey	Submission 274
158-162	ÜNİFORM OLMAYAN HİGRO-TERMAL YÜKLEME ALTINDA DEĞİŞKEN KESİTLİ BİR PLAĞIN RİTZ YÖNTEMİ İLE STATİK ANALİZİ	Turan Yazar, Şeref D. Akbaş	Turkey, Turkey	Submission 275
163-166	HİGRO-TERMAL YÜKLER ALTINDA HOMOJEN OLMAYAN BİR PLAĞIN RİTZ YÖNTEMİ İLE BURKULMA ANALİZİ	Turan Yazar, Şeref D. Akbaş	Turkey, Turkey	Submission 276
167-172	Çinko Ftalosiyanın Yüklenmiş MCM-41 Nanofotokatalizörünün Metilen Mavisinin Fotodegradasyonundaki Etkinliğinin İncelenmesi	Yaşar Gök	Turkey	Submission 280
173-179	Olumlu Bir Öğrenme Ortamı Oluşturma	Aynur Pala	Turkey	Submission 289
180-185	Quantum-Inspired Complex-Valued Neural Network for Prediction of Fractional-Order Lorenz Chaotic Dynamics	Haris Calgan, Metin Demirtas	Turkey, Turkey	Submission 290
186-193	Detection and Mitigation of False Data Injection Attacks in Distribution Networks Using Unsupervised Learning	Haris Calgan, Metin Demirtas	Turkey, Turkey	Submission 291
194-206	Electronic Structure, Charge Transfer, and Reactivity of 5-Fluoro-1-(tetrahydro-2-furyl)-2,4(1H,3H)-pyrimidinedione: A DFT and HF Study	Asaf Tolga ÜLGEN	Turkey	Submission 292
207-218	Theoretical Investigation of 5-fluoro-1-(tetrahydro-2-furyl)-2,4(1H,3H)-pyrimidinedione: Geometry Optimization, Electronic Properties, and Reactivity	Asaf Tolga ÜLGEN, Ali Serol ERTÜRK	Turkey, Turkey	Submission 293
219-225	A Next-Generation Hybrid and Explainable Artificial Intelligence Model for Cyber Attack Detection	Gürkan Doğan, Fırat Artuğer	Turkey, Turkey	Submission 294
226-231	A Low-Profile Uniplanar CPW-Fed Printed Monopole Antenna for Mid-Band 5G Access	Cem Gocen, Caner Murat, Ismail Akdag	Turkey, Turkey, Turkey	Submission 295
232-240	Soft Skills in The Algerian Middle Schools	Rafika HELAIMIA, Zineb BOUGHRARA	Algeria, Algeria	Submission 299
241-249	Exploring Teachers' and Students' Perceptions towards the Use of Gamification in Algerian Primary Schools	Rafika HELAIMIA, Nawfal BECHICHI	Algeria, Algeria	Submission 300
250-255	High-Gain Symmetric Stepped-Impedance CPW-Fed Monopole Antenna with Chamfered Ground for 2.45 GHz WLAN/IoT Applications	Ismail Akdag, Cem Gocen, Caner Murat	Turkey, Turkey, Turkey	Submission 301
256-259	Atmosferik Saçılma ve Soğurmanın Güneş Işınımı Seviyelerine Etkisi	MUSTAFA HALUK AKSOY, YUNUS EMRE KARASU	Turkey, Turkey	Submission 304
260-263	Katı Kültür Fermentasyonu ile Nar Atıklarından Fungal Sitrik Asit Üretiminin İncelenmesi	İlayda İrem Ünsal, Hale Sesler, Işık Çoban	Turkey, Turkey, Turkey	Submission 310

264-270	Design and Simulation of a Fractal-Based Circular Microstrip Patch Antenna with Stepped Impedance Feeding for Multi-Band X-Band Applications	Caner Murat, Cem Gocen, İsmail Akdag	Turkey, Turkey, Turkey	Submission 315
271-278	Haber Metni Sınıflandırmasında Naive Bayes, Decision Tree ve SVM Algoritmalarının Karşılaştırmalı Akademik Analizi	Abdulhak ALASULU, Bashar ALHAJAHMAD	Turkey, Turkey	Submission 319
279-289	A Review of Anti-Reflective Coating Technologies for PV Systems: Materials, Designs, and Performance Enhancement	SAID MAHDI ALI, Yunus Emre KARASU	Turkey, Turkey	Submission 320
290-297	Dalgıç Pompalarda Enerji Tüketimlerinin İzlenmesi ve İyileştirme Çalışmaları	Aydın Rüşen, Selmin Ener Rüşen	Turkey, Turkey	Submission 327
298-303	Doğalgazlı Kazanlarda Aşırı Hava Kullanımının Enerji Verimliliği Üzerindeki Etkisi	Aydın Rüşen, Selmin Ener Rüşen	Turkey, Turkey	Submission 333
304-313	Solunum Yolu Enfeksiyonlarının Makine Öğrenmesi Yöntemleri ile Sınıflandırılması: Karşılaştırmalı Performans Analizi	Muhammed GÜNEŞ, Cüneyt Özdemir, Yahya DOĞAN	Turkey, Turkey, Turkey	Submission 337
314-322	Influence of Infill Density on Tensile and Fracture Behavior of ABS Material in Fused Deposition Modeling	Cem ALPARSLAN, Şenol BAYRAKTAR	Turkey, Turkey	Submission 338
323-334	Effect of Build Orientation on Mechanical Performance of ABS Material: A Comparative Evaluation for Flat, and Upright Directions	Cem ALPARSLAN, Şenol BAYRAKTAR	Turkey, Turkey	Submission 339
335-340	Planya Tezgahının Elektro-Hidrolik Kontrolle Dönüşümü ve Simülasyonu	Mahmut Can ŞENEL	Turkey	Submission 340
341-345	Collision Avoidance for Unmanned Marine Vehicles using Reinforcement Learning	Ahmet Onur ALIÇ, Mehmet DİKMEN	Turkey, Turkey	Submission 342
346-353	Molecular Docking Study of Lilium candidum L. Compounds Targeting Breast Cancer Proteins IJNX and 1A52	Hüseyin Fatih ÇETINKAYA, Serap ÇETINKAYA	Turkey, Turkey	Mail Submission 209
354-361	Targeting Breast Cancer Proteins IJNX and 1A52 with Lilium candidum L.-Derived Compounds: A Computational Study	Hüseyin Fatih ÇETINKAYA, Serap ÇETINKAYA	Turkey, Turkey	Mail Submission 210
362-369	Ocimum basilicum L. Phytochemicals as Emerging Natural Inhibitors of Breast Cancer: A Molecular Docking Approach	Hüseyin Fatih ÇETINKAYA, Serap ÇETINKAYA	Turkey, Turkey	Mail Submission 211
370-378	The Effects Of Humic Acid on Plant Physiology in Fruit Trees	Muhammed Ali KOMECCI, Bekir Erol AK	Turkey, Turkey	Submission 335
378-385	Pruning of Fruit Tress and Its Importance for Physiological Development	Bekir Erol AK, Heydem EKİNCİ	Turkey, Turkey	Submission 336
386-391	NLP Tabanlı Kişisel Tıbbi Asistan Geliştirilmesi	Meliha ARSLAN, Özal YILDIRIM	Turkey, Turkey	Submission 507
392-400	Potanın Perileri Adım Adım: Dünden Bugüne	Burak ERDOĞAN, Levent İLHAN	Turkey, Turkey	Submission 470
401-417	Lüks Cruise Gemilerinde Spa&Wellness Hizmetlerinin İncelemesi	Ayşe Kural Yetişen, İ. Serden Başak	Turkey, Turkey	Mail Submission 5
418-422	NotebookLM-Supported Material Creation: An Application-Oriented Strategy for the Natural Fibers Unit of the Fiber Science Course in the Fashion Design Program	Selma Bulut, Beyza Buzol Mülayim	Turkey, Turkey	Mail Submission 6
423-430	Machine Learning Approaches for Predicting the Mechanical Properties of Nanofiber Yarns	Beyza Buzol Mülayim	Turkey	Mail Submission 7
431-434	Yara İyileşmesi ve Kanıta Dayalı Bakım Yönetimi	Sedef ALATAŞ DEMİRTAŞ, Müşerref Ebru ŞEN	Turkey, Turkey	Mail Submission 8
435-437	Diyaliz Hastalarında Fonksiyonel Kapasitenin Korunması ve Geliştirilmesi	Sedef ALATAŞ DEMİRTAŞ, Müşerref Ebru ŞEN	Turkey, Turkey	Mail Submission 9
438-448	Semptom Tabanlı Hastalık Teşhisinde Makine Öğrenmesi Yaklaşımlarının Performans Analizi	M.Ceyhan AVCI, Cüneyt ÖZDEMİR	Turkey, Turkey	Mail Submission 10
449-453	Structural Information on Coordination Compound Based on Bi(III) Centers of Heteroatomic Aromatic Ligand	Okan UCAR, Ibrahim Ismet OZTURK	Turkey, Turkey	Submission 225
454-460	Erişkin Kök Hücreler ve Genel Özellikleri	Serife Tutuncu	Turkey	Submission 253
461-467	Investigation of the Seismicity of Kütahya and its Surroundings	Evren SEYREK	Turkey	Submission 324
468-472	The Historical Process of Ground Motion Prediction Equations in Turkey	Evren SEYREK	Turkey	Submission 325
473-479	Investigation of Sn Effect in EN-GJL-250 Cast Iron Via Thermo Calc Modelling	Gökhan Arıcı	Turkey	Submission 326
480-485	DENETİM RAPORU GECİKMESİ VE FİRMA PERFORMANSI ARASINDAKİ İLİŞKİ: BORSA İSTANBUL ÜZERİNE BİR UYGULAMA	Gamze SEVİMLİ ÖRGÜN	Turkey	Submission 345
486-494	Koenzim Q10'un Hücresel Enerji Üretimi ve Oksidatif Stres Üzerindeki Rolü	Murat Arı, Serdal Ögüt	Turkey, Turkey	Submission 346
495-499	Analytical Modeling of Viscoelastic Materials Using the Caputo-Fabrizio Fractional	Münevver Tuz	Turkey	Submission 350

	Derivative			
500-505	Stability and Symmetry Analysis of the Quantum Harmonic Oscillator via Operator and Spectral Methods	Münevver Tuz	Turkey	Submission 351
506-510	Influence of Series Resistance and Shunt Resistance on I-V and P-V Characteristics of Solar Cell	Qasem Zaid, Yunus Emre	Turkey, Turkey	Submission 353
507-511	An Examination of War-related Violence and Trauma in Sarah Kane's Play <i>Blasted</i>	Zehra BAYAR, Arzu ÖZYÖN	Turkey, Turkey	Submission 356
508-515	Apathy as an Ethical Refusal: Existential Withdrawal in Virginia Woolf's <i>Mrs Dalloway</i> and Samuel Beckett's <i>Molloy</i>	Ali Can ÖZDEMİR, Arzu ÖZYÖN	Turkey, Turkey	Submission 357
516-521	Adaptif Zaman-Frekans Analizi Yaklaşımıyla Solunum Seslerinin Sınıflandırılması	Yücel KOÇYİĞİT	Turkey	Submission 358
522-526	The effects of climate change on genetic adaptation, animal welfare and production performance in dairy cattle	Ömer ERTEN	Turkey	Mail Submission 4
527-534	Machine Learning-Based Classification and Model Comparison for Psychological Disorder Detection	Halil Çınar, Mehmet Sait Vural, Tarık Talan	Turkey, Turkey, Turkey	Submission 362
535-546	Çakırbağ (Bayburt, KD Türkiye) Plütonunun jeolojisi ve petrografisi	Alaaddin Vural, Abdullah Kaygusuz	Turkey, Turkey	Submission 364
547-558	ERGO-ECONOMICS ASSESSMENT IN VENTILATION SYSTEMS AND AIR DUCTS	Esin Kılıç, Havva Demirpolat	Turkey, Turkey	Submission 365
559-567	Strengths and Limitations of Machine Learning Algorithms in Landslide Susceptibility Assessment	Samet Berber	Turkey	Submission 366
568-571	Design and Comparative Analysis of Bare and Insulated Aluminum Conductors in Low Voltage Overhead Distribution Lines	Hasan Hüseyin Buğday, Levent Seyfi	Turkey, Turkey	Submission 367
572-577	KBRN MÜDAHALE EKİPLERİNİN YETKİNLİK BAZLI ATANMASI	Yusuf Bera Sanlı, Tamer Eren	Turkey, Turkey	Submission 369
578-584	Assessment of Social Phobia Levels of Forestry Engineering Students	Gökhan Şen	Turkey	Submission 370
585-591	A Deep Learning-Based Approach for Playing Card Detection Using YOLO Architectures	Nazanin MOHAMMADZADEH, Kemal ADEM	Turkey, Turkey	Submission 376
591-600	Tüm Kayaç Jeokimyası Verilerine Dayalı Çevresel Risk Değerlendirmesi: Yaylalı (Gümüşhane) Skam Cevherleşmesinde PI ve Igeo Yaklaşımı	Alaaddin Vural, Abdullah Kaygusuz	Turkey, Turkey	Submission 378
601-607	Comparative Thermal and Electrical Performance Analysis of Monocrystalline and Polycrystalline Silicon PV Modules	Baraa KHALAF, Yunus Emre KARASU	Turkey	Submission 379
608-618	A Comparative Study on the Effects of Different Music Genres on EEG Signals	Ilknur Sercek, Turker Tuncer, Sengul Dogan	Turkey, Turkey, Turkey	Submission 381
619-624	PtNiCoO/C Katalizörünün PEM Yakıt Hücrelerinde Anot Performansının İncelenmesi	Arzu EKİNCİ, Orhan BAYTAR	Turkey, Turkey	Submission 383
625-628	Effect of FeCoNiCrTi High-Entropy Alloy Additive on the Electrical Properties of ZA27 Zinc Alloy	Muharrem Pul, Rüstem Yılmazel	Turkey, Turkey	Submission 384
629-635	ATEŞLİ HASTALIKLARDA İLAÇ SEÇİMİ İÇİN MAKİNE ÖĞRENİMİ TABANLI KARAR DESTEK SİSTEMİ VE AÇIKLANABİLİR YAPAY ZEKA YAKLAŞIMI	İrem EVİN, Yahya Doğan, Cüneyt ÖZDEMİR	Turkey, Turkey, Turkey	Submission 385
637-641	Polifenol Oksidazlar ve Uygulamaları	Nurhayat UZUN, Gülnur ARABACI	Turkey, Turkey	Submission 387
642-648	Microstructure, Density, and Hardness Behaviors of Er2O3 Reinforced Al7075 Composites Produced by Powder Metallurgy	İlyas Şavklıyıldız, Mehmet Şahin Atas	Turkey, Turkey	Submission 390
649-654	PEM Yakıt Pilleri için Alternatif Katot Katalizörlerinin Geliştirilmesi ve Tek Hücre Performanslarının İncelenmesi	Orhan BAYTAR, Arzu EKİNCİ	Turkey, Turkey	Submission 393
655-663	Değer Akış Haritalama Yöntemi ile Bir Hastanede Süreç İyileştirme Uygulaması	İrem YELER, Adnan AKTEPE	Turkey, Turkey	Submission 394
664-672	A Comparative Study of Hallucination and Overconfidence in Kumru-2B and Gemma-2B-IT: Evaluation on the TruthfulQA Benchmark	Büşra Tüter, Kürşat Mustafa Karaoğlan, İlker Türker	Turkey, Turkey, Turkey	Submission 397
673-679	Aile Kavramının Sanata Yansımaları	Seda Dilay	Turkey	Submission 399
680-688	Coğrafi Bilgi Sistemleri İle Ümraniye (İstanbul) İlçesine Ait Geoteknik Verilerinin Haritalandırılması	Birgül Eryılmaz, Kurban Öntürk	Turkey, Turkey	Submission 400
689-694	Why Do Big Brands Go Wrong? Strategic Lessons from Classic Failures in Marketing History	Reha SAYDAN	Turkey	Submission 401
695-700	Application of a Schmitz-Based Design Approach for the Experimental Optimization of	Mehmet Seyhan, Himmet Erdi TANÜRÜN	Turkey, Turkey	Submission 402

	SG6043 Blades in Horizontal Axis Wind Turbines			
701-705	Adaptive Learning from Human Corrections: Recent Approaches in Human-in-the-Loop Systems	Musa Ataş, Bashar Alhajahmad, İsa Ataş	Turkey, Turkey, Turkey	Submission 403
706-710	Veteriner Anatomiye Dijital Ölçümleme ve Yapay Zekâ Tabanlı Analizlerin Klinik Önemi	Osman Yılmaz	Turkey	Submission 406
711-715	Scape Anatomy of the Endemic Allium tuncelianum (Amaryllidaceae)	Metin ARMAĞAN, Bayram ATASAGUN, Deniz ULUKUŞ	Turkey, Turkey, Turkey	Submission 409
716-720	Cultivation Experiments on Allium tuncelianum (Tunceli Sarımsağı)	Metin ARMAĞAN	Turkey	Submission 410
721-729	A Review of Surrogate Modeling Techniques for Antenna Design and Optimization	Mehmet Yerlikaya	Turkey	Submission 411
730-736	E-scooter şarj istasyonu yer seçim faktörlerinin önceliklendirilmesi	Ertugrul Ayyıldız	Turkey	Submission 412
737-741	Çevre ile Tarım Arasındaki Karşılıklı Etkileşim ve Sürdürülebilirlik Perspektifi	Adem Özkan, Yusuf Dilay	Turkey, Turkey	Submission 398
742-748	Artificial Intelligence, Science and Ethics: Is it Ethical to Use Artificial Intelligence (AI) in Academic Research?	Recep BAYDEMİR	Turkey	Submission 417
749-753	How Can We Utilise Artificial Intelligence (AI) in the Fight Against Climate Change? Opportunities and Challenges	Recep BAYDEMİR	Turkey	Submission 418
754-758	Emerging Trends in Polyaniline-Based Catalysts for Photocatalytic Applications	Nazlı Turkten, Yunus Karatas	Turkey, Turkey	Submission 419
759-766	Phenotype-Based Recognition: A Comparison of Machine Learning and Deep Learning Approaches	Mustafa İpek, Tarık Talan	Turkey, Turkey	Submission 420
767-773	Experimental Evaluation of Diesel-LPG Dual-Fuel Combustion in Terms of Engine Performance and Environmental Implications	Beytullah Eren, Idris Cesur2	Turkey, Turkey	Submission 422
774-778	Impact of Climate Change on Pavement Performance	Sebnem Karahancer	Turkey	Submission 423
779-782	Şönt Aktif Güç Filtreleri İçin Anti Windup PI tabanlı Aktif DA-Bağ Devresi	Doğan ÇELİK	Turkey	Submission 425
783-787	Effect of Different Additive Types on the Energy Efficiency of Warm Mix Asphalt	Sebnem Karahancer	Turkey	Submission 426
788-794	Comparative Analysis of the Performance and Behavior of Different Selection Operators in Genetic Algorithms	Hilmi KARACA, Emre AVUÇLU	Turkey, Turkey	Submission 427
795-800	Meyve Kuru ile Zenginleştirilmiş ve Lif İçeriği Artırılmış Fonksiyonel Fırıncılık Ürünleri	Rukiye Akdağ, Sultan Karaman, Sude Azapoğlu, Reyhan İrkin	Turkey, Turkey, Turkey, Turkey	Submission 428
801-805	On Properties of Inversions With Respect To Spheres In The Maximum Space	Yunus Cırık, Süheyla Ekmekçi	Turkey, Turkey	Submission 433
806-818	Comparison of Dense Embedding Based RAG Inference with 4-Bit Quantized LLMs	Ahmet AKKAYA, Cemil KÖZKURT	Turkey, Turkey	Submission 434
819-824	Dünya Lucanidae (Coleoptera) Ticareti	Fulya Kaya Apak, Ferhat Kiremit	Turkey, Turkey	Submission 435
825-832	Comparative Performance and Material Evaluation of Thin-Film Photovoltaic Technologies: CdTe, CIGS, and Amorphous Silicon	Ismail Salad ADEN, Yunus Emre KARASU	Turkey, Turkey	Submission 436
833-836	Zeytin Sineği [(Bactrocera oleae (Gmel.), Diptera: Tephritidae] Mücadelesinde Kaolin Uygulamaları	Fulya Kaya Apak	Turkey	Submission 437
837-843	Bilinçli Eşlikten Kaygı Temelli Kontrol: Mindfulness (Bilinçli Farkındalık) Ebeveynlik ve Helikopter Ebeveynliğin Kavramsal Ayrımı	Leyla Ulus	Turkey	Submission 438
844-850	The Importance of Dams and Ponds in Watershed Management: Hydrological, Ecological, and Managerial Dimensions	Senem GÜNEŞ ŞEN	Turkey	Submission 441
851-859	Şeker Endüstrisinde Kullanılan Beş Etkili İleri Beslemeli Evaporatör Sisteminin Taguchi Yöntemi ile Termo-Ekonomik Performans Analizi	Muhammed Asım Kesercioğlu, Nusret Fatih Aktaş, Sinan Çobaner	Turkey, Turkey, Turkey	Submission 442
860-866	FDM Yöntemiyle Üretilen ASA Parçaların Yapıştırma Performansına Birleştirme Geometrisi ve Yan Yüzey Dokusunun (Fuzzy Skin) Etkisi	Muhammed Asım Kesercioğlu, Hüseyin Kahraman, Kubilay Han	Turkey, Turkey, Turkey	Submission 443
867-872	Assessment of Recycled Concrete Aggregates from Different Strength Grades for Sustainable Concrete Production	Mohamed Abdikarin Mohamad, Yasin Onuralp Özkılıç	Turkey, Turkey	Submission 444
873-879	Yenilenebilir Enerji Kaynaklarının Mimarlıkta Kullanımı	Rıhan Basam Hasan HASAN, Edip TAŞKESEN	Turkey, Turkey	Submission 445
880-887	Investigation of Effect of Crystal Structure on Mechanical Properties of Steels	Bekir GÜNEY	Turkey	Submission 446

888-894	The Relationship Between the Opinions of Mediterranean Bay Leaf ( <i>Laurus nobilis</i> L.) Collectors on the Bay Leaf Market and Their Educational Levels	Muhammet Ali Keleş, Gökhan Şen	Turkey, Turkey	Submission 447
895-899	Bitkisel ve Mikrobiyolojik Kaynaklı Pektinazların Üretimi, Özellikleri ve Endüstriyel Uygulamaları	Zeynep Özcan, Gülnur Arabacı	Turkey, Turkey	Submission 448
900-905	İnsani Yardım Tedarik Zinciri Performans Değerlendirmesi: SCOR Bazlı Kriterlerin BWM Yöntemiyle Analizi	Ertugrul Ayyildiz	Turkey	Submission 449
906-909	Endofitik mikroorganizmalar: antimikrobiyal potansiyelleri, biyoteknolojik uygulamaları ve ekolojik rolleri	Fatih KAYAR, Hakan ÖZKAN	Turkey, Turkey	Submission 450
910-914	Yeşil Ceviz Kabuğundan Elde Edilen Fenolikler ve Biyolojik Aktiviteleri Muhmmet Enes	Muhammet Enes KIZILER, Mesut Taşkın	Turkey, Turkey	Submission 451
915-921	Classification of Mental Disorders Using the Decision Tree Method	Özlem BEZEK GÜRE	Turkey	Submission 452
922-925	Meme kanseri verileri üzerinde Naive Bayes ve Lojistik Regresyon Yöntemlerinin sınıflama performanslarının karşılaştırılması	Özlem BEZEK GÜRE	Turkey	Submission 453
926-933	Vibration Suppression of a Single Degree-of-Freedom Undamped System Exposed to Forced Excitation using a Tuned Mass Damper (TMD)	Sena Koçman, Ceren Ünal, Mustafa Eroğlu	Turkey, Turkey, Turkey	Submission 454
934-941	Young People's Perspectives on Social Media Addiction: Sentiment and Thematic Analysis of Social Media Addiction Discourses Based on Twitter Data	Abdullatif Kaban	Turkey	Submission 455
942-948	Ofis Yapılarında Güncel Tasarım Yaklaşımları Ve Bir Ofis Örneğinin İrdelenmesi	Sultan Ece Altınok Çalışkan, Özlem Candan Hergül	Turkey, Turkey	Submission 456
949-957	Evolution, Efficiency Improvements, and Stability Issues of Perovskite Solar Cells: A Review	Mohamed Jama ELMİ, Yunus Emre KARASU	Turkey, Turkey	Submission 457
958-962	A Comparative Analysis of the Performance of CNN and Vision Transformer Models for Medical Image Classification	Huthayfa Abdalqader Mustafa Steih, Esin Ayşe Zaimoğlu	Turkey, Turkey	Submission 458
963-973	A Simulation Study on the Photovoltaic Performance of Zr doped CuO Thin Film Solar Cell	Serap Yigit Gezgin, Silan Baturay, Hamdi Sükür Kilic	Turkey, Turkey, Turkey	Submission 463
974-983	Impact of Acceptor Defect Density and Operating Temperature on the Electrical Properties of CuO/SnO <sub>2</sub> Thin Film Solar Cells: A SCAPS-1D Simulation Study	Serap Yigit Gezgin, Silan Baturay, Hamdi Sükür Kilic	Turkey, Turkey, Turkey	Submission 464
984-990	Web Crippling Behaviour of Pultruded GFRP Hollow Box Sections Under Various Transverse Loads	Mohamed Ahmed Soubourou, Ceyhun Aksoylu, Emrah Madenci, Yasin Onuralp Özkılıç	Turkey, Turkey, Turkey, Russia	Submission 465
991-997	Yeşil Tedarik Zinciri Dayanıklılığı İçin Kapsamlı Bir Değerlendirme Çerçevesi	Ertugrul Ayyildiz	Turkey	Submission 471
998-1004	Geometrik (Non-Newtonian) Aritmetikte Ortalamalar	İlker Eryılmaz	Turkey	Submission 472
1005-1011	Enerji Verimliliği ve Termal Performans Açısından 7 Etkili Geri Beslemeli Evaporatör Sisteminin Termodinamik Optimizasyonu	Sinan ÇOBANER, Yasin AKIN, Hüseyin KAHRAMAN	Turkey, Turkey, Turkey	Submission 473
1012-1017	İleri Beslemeli Çok Etkili Evaporatörlerde Etki Sayısı ve Besin Giriş Konsantrasyonunun Buhar Ekonomisine Etkisi	Sinan ÇOBANER, Kubilay HAN, M. Asım KESERCİOĞLU	Turkey, Turkey, Turkey	Submission 474
1018-1023	SH-SY5Y hücrelerinin in vitro nöron model kullanımına ilişkin Metodolojik Yöntemler	Rahime ALTINTAS, Melda ŞİŞECİOĞLU	Turkey, Turkey	Submission 476
1024-1031	Modeling and Demonstrating Layer-2 MAC Flooding Attacks for Educational Cybersecurity Labs	Bashar ALHAJAHMAD, İsa Ataş, Musa Ataş	Turkey, Turkey, Turkey	Submission 478
13032-1040	Bitki Doku Kültüründe Biyoreaktör Sistemleri: Mikroçoğaltım ve Sekonder Metabolit Üretimine Yönelik Yaklaşımlar	Yelda EMEK, Sevim Buse KONU	Turkey, Turkey	Submission 480
1041-1047	Effects of Wastewater Irrigation on Some Growth Parameters of Pepper Seedlings	Talip ÇAKMAKCI, Özlem ÇAKMAKCI, Suat ŞENSOY, Üstün ŞAHİN	Turkey, Turkey, Turkey, Turkey	Submission 481
1048-1054	Akciğer Tomografi Görüntülerinden Çok Sınıflı Hastalık Tespiti İçin YOLOv8 Tabanlı Bir Yaklaşım	Tahsin Aydın, Banu ULU	Turkey, Turkey	Submission 482
1055-1062	Web Crippling Behavior of Pultruded GFRP Hollow Sections at Different Temperatures	Mohamed Ahmed Soubourou, Ceyhun Aksoylu, Emrah Madenci, Yasin Onuralp Özkılıç	Turkey, Turkey, Turkey, Russia	Submission 484
1063-1069	Investigation of Nonlocal Effects on Vibration and Buckling of Hexachiral Auxetic Nanoplates	Mustafa Eroğlu, Mehmet Akif Koç	Turkey, Turkey	Submission 485
1070-1075	Bir Mücadele Sporü Yolculuğu: Türk Kadın	Aybüke Kılınc, Ekrem Levent İlhan	Turkey, Turkey	Submission 487

	Kick Boksunun Görünümü			
1076-1080	Artificial intelligence applications in airline companies	Harun KARAKAVUZ	Turkey	Submission 488
1081-1091	6082 Alaşımı Aşınma Yüzeylerinin Topografik ve Mikroyapısal Olarak İncelenmesi	Eray Abakay, İbrahim Altınsoy	Turkey, Turkey	Submission 490
1092-1102	Correlation Between AI Adoption in Marketing and Business Growth in Serbian Startups	Milica Balaban, Slavko Alčaković	Serbia, Serbia	Submission 491
1103-1108	Sistemsel Düşünme Becerileri Gelişim Modelleri	Murat Çetinkaya	Turkey	Submission 495
1109-1112	The Fibre Cells of Acer campestre L.	Seray ÖZDEN KELEŞ	Turkey	Submission 496
1113-1125	Surrogate ANN Modeling for Thermal Buckling of FGM Sandwich Plate with Foam Core	Adem Fatih Ozalp	Turkey	Submission 497
1126-1132	Gayrimenkul Sektörünün Ekonomik Büyüme Üzerindeki Rolü: Finansal Göstergeler Çerçevesinde Bir Değerlendirme	İsmail Öztanır	Turkey	Submission 498
1133-1139	$\beta$ -Glucosidase Enzyme Activity as a Key Indicator of Soil Health and Soil Quality	Asuman Büyükkılıç Yanardağ, İbrahim Halil Yanardağ	Turkey, Turkey	Submission 503
1140-1152	Deployable Photovoltaic Sunshades for Vehicle Glazing: Shading-Aware Energy-Yield Modelling and PV-to-Battery SoC Contribution	Oğuz Kürşat DEMİRCİ	Turkey	Submission 504
1153-1160	The Use of Catalase Enzyme Activity as an Indicator of Soil Health and Soil Quality	Asuman Büyükkılıç Yanardağ, İbrahim Halil Yanardağ	Turkey, Turkey	Submission 505
1161-1171	Doğallık ve Sürdürülebilirliğin İzinde Organik Gıda: Uygulamalar, Zorluklar ve Gelecek	Abdullah ELMAS	Turkey	Submission 506
1172-1178	6 Şubat Maraş Depremlerinin Seçmen Davranışına Etkisi	Abdullah ELMAS	Turkey	Submission 510
1179-1189	Matematik Öğretmen Adaylarının Farklı Van Hiele Geometri Öğrenme Düzeylerine Göre Öğrenciden Beklentilerinin İncelenmesi	S. Deniz KILIÇ	Turkey	Submission 511
1190-1198	Ulaşım Sistemlerinin Ekonomik Değerlendirilmesinde Trafik Sıkışıklığı Maliyet Yaklaşımları	Omar Mahmood Abdulghafor Al-Aani, Abdulkadir Özden	Turkey, Turkey	Submission 513
1199-1203	ET ÜRÜNLERİNDE MARİNASYONUN SÜRDÜRÜLEBİLİRLİK AÇISINDAN İNCELENMESİ	Rabia Kübra IRMAK, Hüseyin DURAN, Hamza BOZKIR	Turkey, Turkey, Turkey	Submission 514
1204-1210	KAHVE TEDARİK ZİNCİRİNDE SÜRDÜRÜLEBİLİRLİK: TARIMDAN FİNCANA	Asrın Furkan YABANCI, Hüseyin DURAN, Hamza BOZKIR	Turkey, Turkey, Turkey	Submission 515
1211-1215	MEYVE VE SEBZE YAN ÜRÜNLERİNİN DEĞERLENDİRİLMESİ	Münire AKSÜYEK, Hamza BOZKIR	Turkey, Turkey	Submission 516
1216-1220	Effect of Normalization and Quenching Heat Treatment on Tensile Strength of Powder Metal V-Nb Microalloyed Steel	Mehmet Akif ERDEN, Harun ÇUĞ	Turkey, Turkey	Submission 520
1221-1226	Structural and Mechanical Investigation of Y <sub>2</sub> O <sub>3</sub> Reinforced A360 Aluminum Alloy Produced by Casting Method	Salih Bilal ÇETİNKAL	Turkey	Submission 522
1227-1233	Kum Kalıba Dökümde Farklı Alüminyum Alaşımlarının Porozite Davranışlarının Karşılaştırılması	Murat ÇOLAK	Turkey	Submission 523
1234-1240	Etial 160 Alüminyum Alaşımında Niyobyum (Nb) İlavasının Akıcılığa Etkisi	Murat ÇOLAK, Hüseyin Emre TOPRAK	Turkey, Turkey	Submission 524
1241-1247	A Feature-Based Deep Learning Approach for Pump Leakage Diagnosis	Ozkan Ak, Erkan Caner Ozkat	Turkey, Turkey	Submission 525
1248-1250	The Effect of Soil Properties on Plant Stress Tolerance: Salinity, Drought, pH, and Heavy Metal Stress	İnci Sevinç KRAVKAZ KUŞCU, Nurcan YİĞİT	Turkey, Turkey	Submission 526
1251-1257	A Taguchi-Fuzzy Hybrid Approach for Multi-Objective Optimization of CNC Turning Parameters for AS-Series Magnesium Alloys	Ahmet Kala	Turkey	Submission 531
1258-1263	MgX (X = Ga, P, Pb) Bileşiklerinin Yapısal ve Elektronik Özelliklerinin Yoğunluk Fonksiyonel Teorisine İle İncelenmesi	Leyla Yıldız Karadağ, İlhan Candan, Gülten Kavak Balcı	Turkey, Turkey, Turkey	Submission 540
1264-1271	Yoğunluk Fonksiyonel Teorisine Dayalı İlk Prensipler Yöntemiyle BaTiO <sub>3</sub> ve ZnBiO <sub>3</sub> Perovskitlerinin Yapısal ve Elektronik Özelliklerinin İncelenmesi	İlhan Candan, Rekia Melle Larbi, Gülten Kavak Balcı	Turkey, Turkey, Turkey	Submission 541
1272-1278	4-Floro-N-(6-sülfamoilbenzotiyazol-2-il)benzaminin Fe(II) Kompleksinin Sentezi, Karakterizasyonu ve Antimikrobiyal Aktivitesinin İncelenmesi	Halil İlkimen, Cengiz Yenikaya, Aysel Gülbandır	Turkey, Turkey, Turkey	Submission 214
1279-1287	2,6-Pirazindikarboksilik Asit Türevlerinin Metal Komplekslerinin İncelenmesi	Halil İlkimen	Turkey	Submission 215
1288-1292	Synthesis, Characterization and Thermal Stability of Bismuth(III) Bromide Complex with 2-Mercaptothiazolidine	Okan UCAR, İbrahim İsmet OZTURK	Turkey, Turkey	Submission 226

1293-1297	Synthesis and characterization of magnetically modified activated carbon derived from industrial waste: Application in the adsorption kinetic of heavy metal ions from water	Hasan Saygılı, Gülbahar Akkaya Saygılı	Turkey, Turkey	Submission 407
1298-1307	Potanın Perileri Adım Adım: Dünden Bugüne	Burak ERDOĞAN, Levent İLHAN	Turkey, Turkey	Submission 470

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**6TH INTERNATIONAL CONFERENCE  
ON FRONTIERS IN ACADEMIC  
RESEARCH ICFAR 2025  
DECEMBER 16-17, 2025**

**26.12.2025**

16-17 Aralık 2025 tarihlerinde MEET üzerinden çevrimiçi olarak gerçekleştirilen 6th International Conference on Frontiers in Academic Research ICFAR 2025 konferansı akademik teşvik yönetmeliğinin 9. Maddesine istinaden “Tebliğlerin sunulduğu yurt içinde veya yurt dışındaki etkinliğin uluslararası olarak nitelendirilebilmesi için Türkiye dışında en az beş farklı ülkeden sözlü tebliğ sunan konuşmacının katılım sağlaması ve tebliğlerin yarıdan fazlasının Türkiye dışından katılımcılar tarafından sunulması esastır.” kriterlerini sağlamaktadır. Toplam 487 adet bildirinin yer aldığı kongre iki gün boyunca çevrimiçi olarak gerçekleştirilmiştir.

Türkiye dışından toplam 18 farklı ülkeden (Fas, Cezayir, Pakistan, Hindistan, Çin, Tunus, Katar, İspanya, Irak, Birleşik Arap Emirlikleri, Romanya, Nijerya, Malezya, Sırbistan, Kazakistan, Fransa, Bulgaristan, Bangladeş) katılım sağlanmış olup, 487 adet bildirinin 268 (%55,03) tanesi yabancı katılımcı tarafından sunulmuştur.

*Kongremize ilginiz için teşekkür ederiz.*

*Saygılarımızla,*



*All Sciences Academy*

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DECEMBER 16-17, 2025**

**26.12.2025**

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6TH ICFAR 2025 konferansı bilimsel komitesinin çoğunluğu yabancı bilim insanlarından oluşmaktadır. Aşağıdaki link ile bilimsel komite incelenebilir:

<https://www.icfarconf.com/com>

Ayrıca konferansımızda hakem değerlendirmesi olup hakem değerlendirmesi olumlu sonuçlanmadan ücret talebinde bulunulmamaktadır.

2024 MART DÖNEMİ DOÇENTLİK BAŞVURU ŞARTLARI yönetmeliğinin 8. bölümde yer alan Bilimsel Toplantı tanımlamasının b bendindeki “Diğer Uluslararası/Ulusal bilimsel toplantının düzenleme komitesinde, kurum/tüzel kişilik/karar organı tarafından resmi olarak görevlendirilmiş üniversite/enstitü/bilimsel kurum/branş derneği akademisyen temsilcisi bulunması zorunludur.” şeklindedir.

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04.09.2023

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We confirm that Ing. Ondrej Takáč, PhD. working at J. Selye University takes part in the organization committee of the conferences organized by of All Sciences Academy.

### Confirmation of the Vice Dean of the Faculty of Economics and Informatics

Name of Responsible Person and Signature:

Name and Surname

Sign:

PhDr. Imrich Antalík, PhD.

-----

Date: 04.09.2023

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04.09.2023

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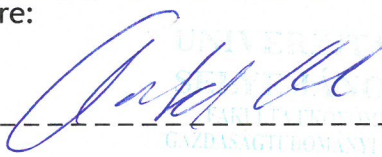
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**16.08.2023**

## **LETTER OF ASSIGNMENT**

We confirm that Prof. Assoc. Dr. Admir Jançe, who is employed full-time as a lecturer, as well as holding the position of Head of the Imaging Department and Vice Dean of the Faculty of Technical Medical Sciences, takes part in the organization committee of the conferences organized by of All Sciences Academy.

### **Confirmation of the Rector/Dean/Vice Dean/Head of Department**

Name of Responsible Person and Signature:

**Rector: Prof. Dr. Tonin GJURAJ**



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Date: 16.08.2023

15.09.2023

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Atatürk Üniversitesi İletişim Fakültesinde görev yapan Doçent Doktor Ülhak Çimen'in All Sciences Academy yayınevi ile beraber düzenlenmesi planlanan konferanslarda ve organizasyonlarda düzenleme veya bilim kurullarında yer alması uygun görülmüştür.

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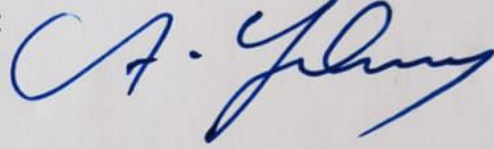
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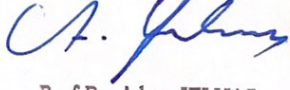
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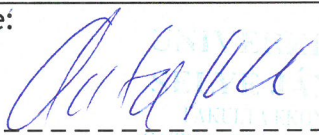


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### Confirmation of the Vice Dean of the Faculty of Economics and Informatics

Name of Responsible Person and Signature:	
Name and Surname	Sign: 
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Date: 04.09.2023	

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01.11.2023

İLGİLİ MAKAMA

İlgi : Öğretim Üyesi Doç. Dr. Nermin KİŞİ'nin 30.10.2023 tarihli dilekçesi.

Yüksekokulumuz Yönetim ve Organizasyon Bölümü Öğretim Üyesi Doç. Dr. Nermin KİŞİ'nin "All Sciences Academy Yayınevi"nin düzenleyeceği bilimsel toplantıların düzenleme ve bilim kurullarında görev almasında Yüksekokulumuzca bir sakınca bulunmamaktadır. İş bu belge ilgilinin isteği üzerine tanzim edilmiştir.

Bilgilerinizi ve gereğini rica/arz ederim.

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## FROM INSTABILITY TO BIOEFFICACY: NANO-ENCAPSULATION OF POLYPHENOLS IN BEVERAGES

<sup>1</sup>\*Dr. Mahwash Aziz

<sup>1</sup>Assistant Professor, Department of Food Science and Technology, Government College Women University, Faisalabad,  
Pakistan

\*Corresponding author: [dr.mahwashaziz@gcwuf.edu.pk](mailto:dr.mahwashaziz@gcwuf.edu.pk)

**Abstract** - Polyphenols are naturally occurring bioactive compounds widely known for their therapeutic properties. Increasing consumer demand for health-promoting beverages has positioned polyphenols as ideal functional ingredients in the development of nutraceutical drinks. However, their application in commercial beverage formulations remains limited due to inherent challenges such as poor water solubility, high sensitivity to temperature, light and oxygen, rapid gastrointestinal degradation, and low bioavailability. These physicochemical limitations significantly reduce their stability, sensory suitability, and functional efficacy during processing and storage. Nano-encapsulation enhances solubility, protects polyphenols from oxidative damage, masks undesirable bitterness and astringency, and facilitates controlled release during digestion, thereby improving bioaccessibility and absorption. Studies have shown 35–65% improvement in bioavailability and 40–80% antioxidant retention in beverage systems after nano-encapsulation. Additionally, nano-encapsulated polyphenols have been successfully incorporated into fruit juices, sports drinks, tea beverages, dairy-based drinks, and probiotic formulations without compromising sensory quality. Despite its potential, commercial application requires deeper investigation into large-scale production feasibility, storage behavior, cost-effectiveness, consumer acceptance, and regulatory safety concerns regarding nanoparticle toxicity and bio distribution. Therefore, this review highlights recent advancements in nano-encapsulation of polyphenols, focusing on techniques, functional improvements, beverage applications, and future research directions. Nano-encapsulation stands as a transformative approach capable of unlocking the full functional potential of polyphenols, enabling the production of stable, high-quality and health-enhancing beverages.

*Keywords: Nano-encapsulation; sensitivity; polyphenol; cyclodextrin; probiotic*

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## Harnessing Citrus Lemon Peel Extract for the Sustainable Synthesis and Solar-Driven Photocatalytic Efficacy of Titanium Dioxide Nanoparticles in Dye Remediation

Sofiane KHANE<sup>1</sup>, Yasmina KHANE<sup>2</sup> and Fares FENNICHE<sup>3</sup>

<sup>1</sup>Faculty of Sciences and Technology, University of Ghardaïa, BP 455, 47000 Ghardaïa, Algeria

<sup>2</sup>Materials, Energy Systems Technology and Environment Laboratory, Faculty of Sciences and Technology, University of Ghardaïa, BP 455, 47000 Ghardaïa, Algeria.

\*[yasminekhane@yahoo.fr](mailto:yasminekhane@yahoo.fr)

**Abstract** – In pursuit of sustainable nanomaterials, this study presents an innovative, eco-friendly synthesis of Titanium Dioxide Nanoparticles (TiO<sub>2</sub> NPs) using Citrus lemon peel aqueous extract as a dual-purpose agent: a bio-reductant and a natural capping ligand. Moving beyond conventional chemical methods, this green synthesis pathway valorizes agro-waste, aligning with the principles of circular economy and green chemistry.

The synthesis was achieved via a modified co-precipitation technique, where the precursor solution was bio-mediated by the phytochemical-rich lemon peel extract, facilitating the formation and stabilization of nanoparticles. A comprehensive characterization suite confirmed the successful fabrication. X-ray Diffraction (XRD) analysis revealed the predominant crystalline phase to be anatase, known for its superior photocatalytic properties, with crystallite sizes estimated using the Scherrer equation. Field Emission Scanning Electron Microscopy (FESEM) elucidated the surface morphology, showing quasi-spherical to polygonal nanoparticles with a size distribution ranging from 50 to 150 nm, while Energy Dispersive X-ray Spectroscopy (EDX) confirmed the elemental purity and successful formation of TiO<sub>2</sub>. The photocatalytic prowess of these bio-synthesized TiO<sub>2</sub> NPs was evaluated under natural sunlight, serving as a cost-effective and renewable energy source. Malachite Green (MG), a recalcitrant and toxic triphenylmethane dye prevalent in textile effluents, was selected as the model pollutant. In a batch-type photoreactor, the nanoparticles demonstrated exceptional solar-harvesting capability, achieving a remarkable 78% degradation of MG within just 45 minutes of irradiation. This high efficiency is attributed to the synergistic effect of the anatase phase and the unique surface properties imparted by the bio-capping agents from the lemon peel, which may enhance visible-light absorption and reduce charge carrier recombination.

**Keywords** – Green Synthesis, TiO<sub>2</sub> Nanoparticles, Citrus Lemon Peel Extract, Bio-reductant, Solar Photocatalysis, Malachite Green Degradation, Dye Remediation

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## **Fostering Critical & Ethical Competence Beyond the Tool: Cultivating Critical AI Literacy and Ethical Reasoning in Pre-Service EFL Teacher Education**

Sebbah DJAMEL<sup>1</sup>

<sup>1</sup>*Department of English Language Ecole Normal Supérieure Oran, Algeria*

[\\*djamelsebbah@gmail.com](mailto:djamelsebbah@gmail.com)

**Abstract** – This paper addresses a critical gap in pre-service English as a Foreign Language (EFL) teacher education by arguing for the urgent integration of critical AI literacy and ethical reasoning alongside technical AI skills. It posits that current training often focuses on tool proficiency, leaving future teachers unprepared to navigate AI's embedded biases, environmental costs, and impacts on student privacy and equity. The study investigates the design and outcomes of a dedicated instructional module within a pre-service program, employing case studies, reflective journals, and scenario-based discussions. Preliminary findings reveal that this intervention successfully shifts participants from a simplistic, tool-centric view of AI towards a nuanced understanding of it as a sociotechnical system that can perpetuate linguistic bias and surveillance. The research concludes that cultivating this critical competence is essential for responsible innovation, empowering teachers to become ethical designers of human-centered learning environments rather than passive technology consumers. Ultimately, the paper contributes a concrete pedagogical framework for embedding these vital competencies into teacher education curricula, aiming to foster more equitable and critically aware technology integration in global language teaching policymakers.

*Keywords* – Artificial Intelligence (AI), Critical AI Literacy, Ethical Reasoning, Pre-service Teacher Education, EFL, Digital Pedagogy, Responsible Innovation

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## Solar Panel Detection Using Convolutional Neural Networks

Berrimi FELLA<sup>1</sup>

<sup>1</sup>Computer Science Department, Sciences Faculty, Ferhat Abbas University–Setif 1, Algeria

[\\*berrimifella@gmail.com](mailto:*berrimifella@gmail.com)

**Abstract** – Convolutional Neural Networks (CNNs) have become a leading approach for automatically detecting solar panels in aerial and ground-level images. Their hierarchical feature-learning capability allows them to identify complex visual patterns such as panel shape, texture, alignment, and reflective properties without relying on handcrafted features. A labeled dataset of solar and non-solar regions is used to train the CNN model, enabling it to learn discriminative representations through convolutional and pooling operations. Advanced architectures such as ResNet, VGGNet, and YOLO-based backbones improve detection accuracy under challenging conditions including noise, shadows, occlusions, and illumination variations. The trained model can automatically localize and classify solar panels in new images, producing reliable bounding boxes that support large-scale photovoltaic monitoring. Overall, CNN-based solar panel detection offers a robust, fast, and scalable solution for industrial inspection and renewable energy infrastructure analysis.

*Keywords* – Solar Panels, CNN, Detection, Deep Learning, Computer Vision

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## Blow-Up of Timoshenko System

Baibeche SABAH<sup>1</sup>, Slimani ALI<sup>2</sup>, Bouzettouta LAMINE<sup>3</sup> and Karek CHAFIA<sup>4</sup>

<sup>1</sup>Preparatory department, The National Higher School Of Biotechnology Taoufik Khaznadar,, Algeria

<sup>2</sup>Department of software and information systems technology, University of Abdelhamid Mehri Constantine 2, Algeria

<sup>3</sup>Department mathematics/(LAMAHS), University of 20 August 1955, Skikda, Algeria

<sup>4</sup>Department mathematics/(LAMAHS), University of 20 August 1955, Skikda, Algeria

[\\*sabahbaibeche1@gmail.com](mailto:*sabahbaibeche1@gmail.com)

**Abstract** – This work examines finite-time blow-up in a nonlinear Timoshenko beam system. The model describes coupled transverse and rotational motions of an elastic beam with damping and nonlinear source terms. Using energy methods and Lyapunov-type functionals, we establish conditions under which the system’s energy becomes unbounded in finite time. The results show how the interaction between damping and nonlinearity can still lead to instability, especially for initial data with sufficiently large or negative energy. This provides a clearer understanding of when Timoshenko systems lose regularity and helps guide further analytical and numerical studies.

*Keywords* –Timoshenko syste, blow-up, finite-time singularity, nonlinear damping, energy method

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## Robust Energy Management Strategy for PV–Battery Systems in Residential Applications

Toufik SEBBAGH<sup>1</sup>, Amina GABOUR<sup>2</sup> and Beldjaatit CHAHINEZ<sup>3</sup>

<sup>1</sup>LGMM, University of Skikda, Algeria

[\\*t.sebbagh@univ-skikda.dz](mailto:t.sebbagh@univ-skikda.dz)

**Abstract** – This paper presents a simple and practical energy management strategy (EMS) for photovoltaic (PV) systems integrated with battery storage in residential environments. The proposed EMS relies on a set of intuitive rule-based decisions designed to maximize local PV self-consumption, reduce reliance on the utility grid, and ensure the safe and reliable operation of the battery. The system architecture includes a PV generation unit, a lithium-ion battery bank, a bidirectional inverter, and a residential load, all modeled dynamically in MATLAB/Simulink. Realistic solar irradiance and household demand profiles are used to evaluate system behavior under typical daily operating conditions.

The EMS determines the battery charging and discharging actions according to PV power availability and predefined State of Charge (SOC) thresholds, while also managing the interaction with the electrical grid. When PV production exceeds demand, the battery is charged until its upper SOC limit is reached; conversely, during deficits, the battery discharges to support the load as long as its SOC remains above a minimum threshold. Grid import or export occurs only when necessary, ensuring optimal utilization of local renewable energy.

Simulation results demonstrate a noticeable improvement in PV self-consumption, a reduction in peak grid demand, and more controlled battery cycling, thereby enhancing the overall efficiency and lifespan of the storage system. The proposed strategy offers a low-complexity, low-cost, and easily implementable solution suitable for residential users seeking to increase renewable energy utilization and improve energy autonomy.

*Keywords* – Photovoltaic (PV) Systems, Battery Energy Storage, Energy Management Strategy (EMS), State of Charge (SOC) Control, Residential Microgrid

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## Blockchain as a Catalyst for Transparent Requirement Engineering in GSD

Asif AHMAD<sup>1</sup>, Zain UL IMAN<sup>2</sup> and Muhammad SAAD ASIF<sup>3</sup>

<sup>1</sup>Institute of Food and Nutritional Sciences, PMAS- Arid Agriculture University Rawalpindi, Pakistan

<sup>2</sup>University Institute of Information Technology, PMAS- Arid Agriculture University Rawalpindi, Pakistan

[\\*asifahmad@uaar.edu.pk](mailto:asifahmad@uaar.edu.pk)

**Abstract** - Global Software Development (GSD) has emerged as a dominant paradigm, enabling organizations to leverage distributed teams, diverse expertise, and cost efficiencies. However, the geographically dispersed nature of GSD introduces significant challenges in requirement engineering, including trust deficits, communication gaps, traceability issues, and inconsistencies in stakeholder collaboration. Traditional requirement engineering frameworks often struggle to ensure transparency, accountability, and immutability across distributed environments. This paper proposes the integration of block chain technology into requirement engineering processes to address these challenges. Block chain's decentralized ledger, consensus mechanisms, and smart contracts provide a secure and tamper-proof infrastructure for managing requirements across global teams. By embedding requirement specifications, validation records, and change histories into block chain, stakeholders can achieve enhanced traceability, verifiability, and trust in collaborative development. The proposed framework emphasizes decentralized governance, automated compliance, and immutable documentation, thereby reducing conflicts and ambiguities in requirement elicitation and management. Furthermore, block chain-enabled requirement engineering fosters accountability by ensuring that all modifications are securely logged and auditable. This approach not only strengthens collaboration among distributed teams but also aligns with the growing demand for secure, transparent, and globally scalable software development practices. The paper concludes that block chain-based requirement engineering frameworks can significantly improve reliability, efficiency, and stakeholder confidence in GSD, paving the way for more resilient and future-ready software ecosystems.

*Keywords* - Requirement Engineering, Global Software Development, Blockchain, Smart Contracts, Traceability, Transparency, Collaboration, Decentralized Framework, Software

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## Hesaplamalı Yöntemler Kullanılarak Parkinson Hastalığı İçin Bitki Bazlı İlaç Adaylarının Analizi

Emre AKTAŞ<sup>1</sup> ve Nehir ÖZDEMİR ÖZGENTÜRK<sup>2</sup>

<sup>1</sup>Moleküler Biyoloji ve Genetik Bölümü /Yıldız Teknik Üniversitesi, Türkiye

[\\*emrea@yildiz.edu.tr](mailto:emrea@yildiz.edu.tr)

**Özet** – Bu çalışmada, Parkinson hastalığına yönelik yeni fitokimyasal temelli terapötik adayların belirlenmesi amacıyla kapsamlı bir *in silico* yaklaşım uygulanmıştır. Geniş bir fitokimyasal kütüphane üzerinde gerçekleştirilen üç aşamalı benzerlik taraması sonucunda levodopaya yapısal olarak benzeyen ikili ve üçlü kombinasyonlar belirlenmiştir. Hordenin–rosmarinik asit, eugenol–rosmarinik asit ve 3-siyanoalanin–eugenol gibi ikili kombinasyonların yanı sıra 3-siyanoalanin, eugenol, allicin, sinapik asit ve rosmarinik asit içeren üçlü kombinasyonlar, levodopa farmakoforuna yakın kimyasal özellikler sergilemiştir. ADME/Lipinski değerlendirmeleri, seçilen tüm kombinasyonların uygun farmakokinetik özelliklere ve kan–beyin bariyerini geçme potansiyeline sahip olduğunu göstermiştir. QSAR modellemeleri, aday bileşiklerin biyolojik aktivite açısından pozitif öngörü değerlerine sahip olduğunu ortaya koymuştur. Yüksek verimli (high-throughput) docking analizleri ise dopaminerjik hedefler ve geniş bir off-target paneli üzerinde güçlü bağlanma afinitesi gösterirken, istenmeyen etkileşimlerin düşük olduğunu göstermiştir. Rezidü düzeyindeki incelemelerde Asp, Glu, Tyr, Phe, Ser ve Lys gibi levodopa ile ilişkili kritik amino asitlerle güçlü hidrojen bağları,  $\pi$ – $\pi$  etkileşimleri ve hidrofobik temaslar gözlenmiştir. En iyi adaylar arasında 3-siyanoalanin + eugenol + rosmarinik asit kombinasyonu ve ECA (eugenol–siyanoalanin–allicin) yapısı en yüksek docking skorlarına ulaşmıştır. Hem klasik moleküler dinamik (MD) simülasyonları hem de metadynamics analizleri ile adayların dinamik kararlılığı değerlendirilmiştir. Klasik MD sonuçları stabil RMSD, RMSF, Rg ve SASA profilleri ortaya koyarken, metadynamics analizleri ECA'nın levodopaya kıyasla en az iki kat daha derin ve kararlı bir serbest enerji kuyusu oluşturduğunu göstermiştir. Bu bulgular, seçilen fitokimyasal kombinasyonların Parkinson tedavisi için umut vaat eden farmakofor adayları olduğunu ve ileri düzey *in silico*, *in vitro* ve *in vivo* çalışmalar için güçlü bir temel sağladığını göstermektedir.

**Anahtar Kelimeler** – Parkinson hastalığı, Metadynamics, Levodopa benzeri farmakoforlar, Moleküler dinamik simülasyonları, Yüksek verimli docking, ADME/Lipinski değerlendirmesi, İlaç tasarımı, Hesaplamalı ilaç keşfi



## Seismic Performance Assessment of RC Frames with Masonry Infills Considering In-Plane and Out-Of-Plane Interaction

Abdelghaffar MESSAOUDI<sup>1</sup>

<sup>1</sup>Laboratory of Research in Civil Engineering, University of Biskra, Biskra 07000, Algeria

[\\*a.messaoudi@univ-biskra.dz](mailto:a.messaoudi@univ-biskra.dz)

**Abstract** – This study evaluates the seismic performance of reinforced concrete (RC) frames with masonry infill walls by explicitly considering the interaction between in-plane (IP) and out-of-plane (OOP) responses under earthquake loading. Although masonry infills are often treated as non-structural elements in design practice, their presence significantly influences the seismic behavior of RC buildings due to complex interactions during ground motion. In this research, advanced experimental and numerical analyses were conducted to investigate how IP deformation and OOP inertia forces collectively affect the vulnerability, damage progression, and overall seismic resilience of infilled RC frames.

A set of performance indicators was developed based on in-plane and out-of-plane damage thresholds, and incremental dynamic analyses (IDA) were carried out on three-dimensional RC frame models to capture their response under increasing seismic intensity. The results indicate that accounting for IP-OOP interactions leads to noticeably higher probabilities of infill damage and reduced structural performance compared with models that neglect such interactions. Notably, the interaction effects were most pronounced in the medium to severe damage states, highlighting the deterioration mechanisms that occur when masonry panels are simultaneously subjected to multi-directional seismic demands. These findings emphasize the importance of including coupled IP and OOP behaviors in seismic assessment and design models to obtain more realistic predictions of structural performance in earthquake-prone regions.

**Keywords** – Reinforced concrete frames, masonry infills, seismic performance, in-plane/out-of-plane interaction, vulnerability assessment

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## Modeling the Dynamic Behavior of a Wind Turbine

Salhi HOURIA<sup>1</sup>, Hamou NOURI<sup>2</sup>, Meziane KACI<sup>3</sup>, Hakim AIT SAID<sup>4</sup> and Massinissa AISSOU<sup>5</sup>

<sup>1</sup>Department of Electrical Engineering, University Setif 1- Ferhat Abbas, Setif, 19000, Algeria

<sup>2</sup>Electrical Engineering Department, University of Khemis Miliana, 44000, Algeria

<sup>3</sup>Electrical Engineering and Automatic Department, University of Relizane, 48000 Algeria

<sup>4</sup>Electrical Engineering Department, University of Ain Temouchent, 46000, Algeria

\*[nouri\\_hamou@yahoo.fr](mailto:nouri_hamou@yahoo.fr)

**Abstract** –Sustainable energy supply remains a major requirement for modern societies to meet the growing energy demand caused by increased consumption due to demographic and industrial expansion. This problem has highlighted the need to research alternative energy sources. Researchers worldwide are currently focusing on renewable energy technologies, such as wind power. This energy source has immense natural potential and is widely distributed across the globe. However, the power output depends on climatic conditions.

Wind power is one of the best forms of renewable energy and has proven to be one of the most economical and efficient. It has been used for a long time, and wind turbines are mainly divided into two types: fixed-speed and variable-speed. Variable-speed turbines offer higher energy efficiency than fixed-speed turbines. This paper is a study of the active and mechanical power generation and control of a wind turbine based on a doubly fed induction generator.

*Keywords* – Renewable energy technologies, wind turbine, Doubly fed induction generator, Variable-speed turbines

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## Çok Duvarlı Karbon Nanotüp İçeren Dizel Karışımlarla Yük Bağımlı Motor Davranışının Deneysel Analizi

Mehmet ÇELİK<sup>1</sup>, Ezgi NUR ÇOMAK<sup>2</sup>, Emin ARDA DEMİRCİ<sup>3</sup>

<sup>1</sup>Otomotiv Mühendisliği, Mühendislik ve Doğa Bilimleri Fakültesi, Karabük Üniversitesi, Türkiye

<sup>2</sup>Otomotiv Mühendisliği, Mühendislik ve Doğa Bilimleri Fakültesi, Karabük Üniversitesi, Türkiye

<sup>3</sup>Otomotiv Mühendisliği, Mühendislik ve Doğa Bilimleri Fakültesi, Karabük Üniversitesi, Türkiye

\*[mehcelik@karabuk.edu.tr](mailto:mehcelik@karabuk.edu.tr)

**Özet** – Bu çalışmada, dizel yakıtı ilave edilen çok duvarlı karbon nanotüp (MWCNT) katkılarının motor performansı ve egzoz emisyonları üzerindeki etkileri deneysel olarak araştırılmıştır. Deneysel olarak kullanılan yakıtlar, hacimce 60 ve 100 ppm oranlarında MWCNT içerecek şekilde hazırlanmış; bu süreçte mekanik ve ultrasonik karıştırma yöntemleri birlikte uygulanmıştır. Motor performans testleri farklı yük seviyelerinde gerçekleştirilmiş ve başta özgül yakıt tüketimi (ÖYT) ve termik verim olmak üzere temel performans parametreleri değerlendirilmiştir. Elde edilen sonuçlar, MWCNT katkısının tüm yük kademelerinde ÖYT’yi azalttığını ve termik verimi artırdığını ortaya koymuştur. Motor yükü arttıkça termik verimin yükseldiği, MWCNT katkılı yakıtların ise katkısız dizel yakıtı kıyasla daha yüksek termik verim sağladığı belirlenmiştir. MWCNT katkısının, yakıt-hava karışımını iyileştirerek eksik yanma ürünlerinden olan karbonmonoksit (CO) emisyonlarını azalttığı; buna karşılık, yanma veriminin ve yanma sıcaklığının artmasına bağlı olarak karbondioksit (CO<sub>2</sub>) ve azot oksit (NO<sub>x</sub>) emisyonlarında katkı oranına bağlı bir artış gözlemlendiği tespit edilmiştir. Bu bulgular, MWCNT katkı malzemelerinin içten yanmalı motorlarda performans iyileştirme ve emisyon karakteristiklerini değiştirme potansiyeline sahip olduğunu göstermekte ve motor tasarım ile optimizasyon çalışmalarına bilimsel altyapı sunmaktadır.

*Anahtar Kelimeler – Dizel motorlar, Motor Performansı, Karbon nanotüp, Yakıt katkıları, Egzoz emisyonları*



## Heat Dissipation Enhancement in Gyroid-Based TPMS Geometry

Khaoula AMARA<sup>1</sup> and Ridha ABDELJABAR<sup>2</sup>

<sup>1</sup>Research Lab TEMI, Department of Technology, Faculty of Sciences, University of Gafsa, Sidi Ahmed Zarroug, Gafsa 2112, Tunisia

<sup>2</sup>National Engineering School of Gabes, University of Gabes, Zrig Eddakhlania 6029, Tunisia

[\\*amarakhaoula3@gmail.com](mailto:*amarakhaoula3@gmail.com)

**Abstract** – Gyroid-based Triply Periodic Minimal Surface (TPMS) structures offer enhanced heat dissipation due to their high surface area, continuous pathways, and tunable porosity. In this study, metal 3D-printed gyroid TPMS structures were tested under forced water cooling and uniform heat flux. Numerical simulations using the Navier–Stokes and energy equations complemented the experiments. Results show strong agreement and indicate that porosity and pressure drop significantly affect thermal performance. Gyroid TPMS geometries demonstrate superior cooling efficiency, making them promising candidates for advanced thermal management systems.

**Keywords** – Gyroid, TPMS, Heat dissipation, 3D printing, Porous structures

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## Contribution to the Identification of Necrophagous Insects in the Guelma Region

Widad BELKHIRI<sup>1</sup>, Fatma DJAMAA<sup>2</sup>, Yousra BOUNAB<sup>3</sup>

<sup>1</sup>University of 8 May 1945 Guelma, Faculty of Natural and Life Sciences, Earth and Universe Sciences. Specialty : Applied Microbiology. Department : Ecology and Environmental Engineering.

<sup>2</sup>Teacher–researcher at the University of 08 May 1945 Guelma,

<sup>3</sup>University of 8 May 1945 Guelma, Faculty of Natural and Life Sciences, Earth and Universe Sciences. Specialty : Applied Microbiology. Department : Ecology and Environmental Engineering.

\*[widadbelkhiri.bio@gmail.com](mailto:widadbelkhiri.bio@gmail.com)

\*[fatmadjamaa88@gmail.com](mailto:fatmadjamaa88@gmail.com)

\*[yousrabounab01@gmail.com](mailto:yousrabounab01@gmail.com)

**Abstract** - Forensic entomology, a discipline linked to legal medicine, involves estimating the date of death. More precisely, it is referred to as the post-mortem interval (PMI). In this study, we were interested in studying the necrophagous insect fauna associated with rabbit carcasses in the Guelma region during the spring season. We also applied three types of sacrifice (slaughter by exsanguination, slaughter by exsanguination with acidification, and euthanasia) and examined the effect of two conditions sunlight and shade on carcass decomposition and insect succession during this season. Our study was conducted at the National Institute of Criminalistics and Criminology. Six rabbits were sacrificed. There was a diverse succession of necrophagous insects. Diptera of the Calliphoridae family were the first colonizers and the most predominant. Both adults and larvae were collected. Climatic data were recorded, and the PMI was calculated using the Accumulated Degree Days (ADD) method. The first colonizers were Diptera from the Calliphoridae family (*Lucilia sericata* and *Calliphora vicina*). The PMI calculation provided an estimate close to the actual time of death. Thus, the results obtained in this study can help improve our fundamental knowledge and understand the existing relationship within the diversity of necrophagous insect fauna in Algeria.

*Keywords* - Forensic medicine, ecology, insects, organic matter, post-mortem interval.

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## Regional Variations in Breast Cancer Profiles : A Comparative Study Between Souk Ahras and Sedrata, Eastern Algeria

Khaoula MENAIAIA<sup>1</sup>

<sup>1</sup>Université Mohamed Chérif Messaadia

[k.menaiaia@univ-soukahras.dz](mailto:k.menaiaia@univ-soukahras.dz)

**Abstract** - Breast cancer remains the leading cause of cancer-related mortality among women in Algeria. In this context, our study aims to analyze the epidemiological, biological, and biochemical characteristics of breast cancer in patients monitored in two regions of eastern Algeria: Souk Ahras and Sedrata. The central issue lies in the potential regional variations in tumor profiles, which may influence therapeutic response and prognosis.

We conducted a retrospective descriptive study based on medical records. Collected data included hormone receptors (ER, PR), HER2 status, and the proliferation index Ki-67. The results show that tumors in Sedrata are predominantly hormone-sensitive (83.3%), with a moderate Ki-67 and a higher frequency of HER2-positive tumors, reflecting a generally more favorable biological profile. In contrast, in Souk Ahras, there is a predominance of triple-negative tumors (35.3%) and a high Ki-67 index (70.6%), indicating a more aggressive phenotype. In conclusion, this study highlights the importance of individualized patient management and regular biological monitoring, particularly in regions presenting aggressive tumor profiles.

*Keywords* - Breast cancer, Hormone receptors, Souk Ahras, Sedrata, Epidemiology, Tumor profile

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## Evaluating the Thermal Comfort Conditions in Traditional Mud Buildings of South-Eastern Nigeria

Akubue JIDEOFOR ANSELM<sup>1</sup>

*<sup>1</sup>Department Architecture, Faculty of Environmental Sciences, Baze University Nigeria*

*[\\*akjideofor@yahoo.com](mailto:*akjideofor@yahoo.com)*

**Abstract** – The issue of occupant thermal comfort is paramount in the discussion of sustainable housing. In the case of Sub-Saharan Africa where majority of the population live in Low-cost houses, identifying the best solutions to indoor thermal comfort is of significant value. This study was conducted in order to gather information on the thermal and climatic conditions as well as the thermal preferences of occupants of traditional mud houses in the South-Eastern part of Nigeria. The data collected through physical measurement and surveys were subjected to descriptive analysis. Graphs and normal distribution tables were used to determine the comfort temperature, thermal sensation and thermal preference of the occupants. The result of the study showed that thermal comfort has significant value as well as indicated that more research is required in some of the aspects of the study, especially in the area of design, performance of traditional building materials and other variables that determine thermal comfort in the traditional mud residential buildings in the study area.

**Keywords** – *Thermal comfort, Traditional buildings, Mud houses, Thermal sensation, Thermal preferences, South-eastern Nigeria*

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## **Earth Homes; Building Design Process Integrated with Nature**

Akubue JIDEOFOR ANSELM<sup>1</sup>

*<sup>1</sup>Department Architecture, Faculty of Environmental Sciences, Baze University Nigeria*

*[\\*akjideofor@yahoo.com](mailto:*akjideofor@yahoo.com)*

**Abstract** – It is a well-known fact that the construction and operation of buildings consume the majority of the world's natural resources and energy, and contribute the bulk of landfill waste. Close to this fact is the issue of housing affordability to which majority of the world's citizens fall victim to. Many housing problems could be traced to this issue of home affordability while in the backdrop, lies alternative ideas and means of providing less complex shelters that are more economical and sustainable, by the use of renewable and subsistent materials and techniques that are less tasking than the modern techniques of our present day 'Construction technology'.

*Keywords – Earth homes, Earth dwellings, Sustainable building, Economic design, Nature integrated design, Earthen material designs, Ecological design, underground homes*

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## Design Concepts for Earth Sheltered Urban Ground-Scrapers

Akubue JIDEOFOR ANSELM<sup>1</sup>

<sup>1</sup>Department Architecture, Faculty of Environmental Sciences, Baze University Nigeria

[\\*akjideofor@yahoo.com](mailto:*akjideofor@yahoo.com)

**Abstract** – The history of human housing portrays Earth sheltered homes as dwellings originally developed for shelter, warmth and security for the earliest human dwellers. Further studies reveal its thermal efficiency between seasons and energy conservation properties due to its thermal mass application. A review of typologies identifies various techniques of its design and construction across the globe. This paper investigates the uniqueness in the design concepts of earth sheltered housing as models for future earth-contact housing needs based on the energy conservation and thermal performance of this category of housing. Earth contact characteristics of these types of houses makes for potential energy conservation in single unit earth sheltered homes; however, large scale concepts consequently possess the potentials for optimization of thermal and energy performance. Hence communal type concepts are presented as ideas for urban scale application of Earth sheltered housing.

*Keywords - Earth shelters, building with earth, earth homes, underground building, ground scrapers, thermal mass.*

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## Parametric Analysis of the Seismic Behavior of Reinforced Concrete Shear Walls in Buildings: Application of the Pushover Method

Salem MERABTI<sup>1</sup>, Amar MEZIDI<sup>2</sup> and Abdellah BOODINA<sup>3</sup>

<sup>1</sup>Acoustics and Civil Engineering Laboratory, Faculty of Science and Technology, University of Khemis-Miliana, Algeria,  
<sup>2</sup>Faculty of Science and Technology, University of Khemis-Miliana, Algeria

\*[s.merabti@univ-dbk.m.dz](mailto:s.merabti@univ-dbk.m.dz)

**Abstract** – This study investigates the seismic performance of reinforced concrete buildings ranging from 5 to 20 stories using nonlinear static pushover analysis. Four shear wall bracing configurations are considered: L-shaped peripheral walls, central core, double central core, and double peripheral core systems, with wall thicknesses of 15, 20, and 25 cm, all subjected to unidirectional lateral loading. Although these configurations are widely implemented in both moderate and high seismicity regions, few comparative studies have assessed their nonlinear seismic resistance. The results indicate that central core configurations provide superior control of inter-storey drift, with a significant reduction in lateral displacements—up to 48% compared to peripheral wall systems. In contrast, peripheral wall systems exhibit higher drift demands, reaching a maximum of 0.124% for 15 cm thick walls. The analysis also highlights the effectiveness of L-shaped walls in mid-rise buildings, particularly those with wall thicknesses of 20 and 25 cm. The study of deformation mechanisms reveals a concentration of plastic hinges and thus stress in L-shaped wall systems and at beam-wall joint regions.

**Keywords** – Multi-storey building, Nonlinear pushover analysis, Reinforced concrete shear wall, Inter-storey drift, Shear stress, Overturning moment.

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## Mechanical Behavior of Fiber-Reinforced Concrete at High Temperature

Fatma TAOUCHE-KHELOUI<sup>1</sup>, Ourdia FEDAOUI-AKMOUSSI<sup>2</sup>, Fatma BOUZEBODJA<sup>3</sup>, Chafika ALI AHMED<sup>4</sup>, Souad AIT TALEB<sup>5</sup> and Abdelmadjid SI SALEM<sup>6</sup>

<sup>1</sup>L2MSGC laboratory, Civil engineering department, University Mouloud Mammeri of Tizi Ouzou, Algeria.

<sup>2</sup>Civil engineering department. University Mouloud Mammeri of Tizi Ouzou, Algeria

\*[fatma.kheloui@ummo.dz](mailto:fatma.kheloui@ummo.dz)

**Abstract** – Fiber concretes have very satisfactory intrinsic mechanical properties at room temperature. However, their behavior in the face of extreme conditions such as fires still raises several questions. The objective of this research is to study and better understand the behavior of fiber-reinforced concretes at high temperature, as well as the impact of the evolution of temperature on their mechanical properties, by evaluating the loss of residual mass, the resistance residual in compression and tension.

The concretes are subjected to different heating and cooling cycles up to a maximum temperature of 600°C and 800°C at the age of 28 days. This study revealed that the residual strength of fiber - reinforced concretes decreased significantly when exposed to high temperatures compared to concretes not subjected to such conditions. For all the temperatures examined, the metal fiber concretes showed a significantly higher resistance compared to the polypropylene fiber concretes and the mixed concretes. At 800°C, the mixed fiber concretes showed spalled areas, while the metal fiber and polypropylene concretes developed microcrack networks without spalling.

The obtained results demonstrate the crucial contribution of metallic fibers to the enhancement of the mechanical performance of concrete exposed to elevated temperatures and highlight the differing thermo-mechanical behaviors of various fiber-reinforced concrete types. These outcomes provide essential guidance for the structural design and assessment of fire-resistant concrete elements and offer valuable directions for future research focused on optimizing the performance of fiber-reinforced concretes subjected to severe thermal conditions.

*Keywords* – Concrete, polypropylene fibers, metal fibers, Temperature, resistance

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## İki Tabakalı Bir Plâğın Ritz Yöntemi ile Higro-Termal Burkulma Analizi

Turan YAZAR<sup>1</sup> ve Şeref D. AKBAŞ<sup>2</sup>

<sup>1</sup>İnşaat Mühendisliği, Lisansütü Eğitim Enstitüsü, Bursa Teknik Üniversitesi, Türkiye

<sup>2</sup>İnşaat Mühendisliği, Mühendislik ve Doğa Bilimleri Fakültesi, Bursa Teknik Üniversitesi, Türkiye

[\\*turan.yazar.tr@gmail.com](mailto:turan.yazar.tr@gmail.com)

**Özet** –İki tabakalı kare kompozit plakların higro-termal yükler altındaki burkulma analizi Ritz yöntemi kullanılarak klasik plak teorisi çerçevesinde incelenmiştir. Tabakaların farklı malzeme özelliklerine sahip olduğu ve plak sınır koşullarının 4 tarafı basit mesnetli (SSSS) olarak alınmıştır. Plak burkulmasına ait hareket denklemleri enerji ifadelerinden elde edilmiştir. Toplam potansiyel enerjinin minimum prensibinden yararlanılarak Ritz yaklaşım fonksiyonları ile birlikte burkulma problemine ait özdeğer/özvektör problemi çözülmüştür. Sayısal çalışmalarda, plak narinlik oranının, tabakalar arası Young modülü oranının higrotermal burkulmaya olan etkileri araştırılmıştır.

*Anahtar Kelimeler – Tabakalı Plaklar, Higro-Termal Etki, Burkulma, Ritz Yöntemi*

## Design And Analysis of an RF Energy Harvesting System for Low-Power Electronic and Iot Applications

Atik HASAN NISHAT<sup>1</sup>, Saleha NASRIN MISHU<sup>2</sup>, Nowrin JANNAT<sup>3</sup>, Prithwiraj BISWAS PALLAB<sup>4</sup>,  
Firoz AHMED<sup>5</sup> and M. Hasnat KABIR<sup>6</sup>

<sup>1</sup>Department of Information and Communication Engineering, University of Rajshahi, Rajshahi-6205, Bangladesh

[\\*firozice01@gmail.com](mailto:*firozice01@gmail.com)

**Abstract** – The rapid expansion of wireless communication technologies and the proliferation of Internet of Things (IoT) devices have increased the need for sustainable, maintenance-free power sources for low-power electronics. RF energy harvesting has emerged as a promising approach by capturing and converting ambient radio frequency (RF) signals into usable electrical energy. This paper presents the design and analysis of an RF energy harvesting system intended to power low-power electronic and IoT applications without relying on conventional batteries. The proposed system collects ambient RF energy from sources such as cellular networks, Wi-Fi access points, and broadcast transmitters using a frequency-specific antenna. An impedance matching network maximizes power transfer to the rectification stage, where low forward-voltage drop diodes (1N34, 1N4148, OA79) convert RF alternating current (AC) into direct current (DC). To stabilize the inherently low and fluctuating output, capacitors of 10  $\mu$ F and 47  $\mu$ F are used for energy storage and filtering. System performance is evaluated in terms of output voltage, stability, and adaptability to varying low-power loads, with voltage regulation included to ensure a reliable supply for sensitive components. Results indicate that the proposed RF energy harvesting system can function as a viable, environmentally friendly alternative to battery-based power, especially in scenarios where battery replacement is impractical. This study demonstrates the potential of RF energy harvesting for self-powered, low-maintenance electronic systems and supports the development of sustainable solutions for wireless sensor networks, distributed IoT nodes, and remote monitoring applications.

**Keywords** – RF Energy Harvesting, Antenna, Rectifier Circuit, Energy Storage, Low-Power Electronics, Diode-Based Rectification, Internet of Things (IoT), System Design, Performance Analysis

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## Microalgae Culture: Approaches and Applications in Aquaculture

Hadjer GOUDJIL<sup>1</sup> and Sara HAMIQUA<sup>2</sup>

<sup>1</sup>Process Engineering Department, University Yahia Fares of Medea, Algeria

<sup>2</sup>Process Engineering Department, Morsli Abdellah University of Tipaza, Algeria

[\\*hadjerchimie@gmail.com](mailto:hadjerchimie@gmail.com)

**Abstract** – This work studies microalgae cultivation techniques and their applications, particularly in nutrition and bioenergy. Algae, chlorophyll-containing organisms living in wetlands or aquatic environments, are classified into several divisions based on their morphology, pigments, biochemical composition, and mode of reproduction. The main divisions of algae are microalgae and macroalgae, which are distinguished primarily by their size, structure, and lifestyle. The main difference between macroalgae and microalgae lies in their size and cellular organization: macroalgae are large, multicellular aquatic organisms capable of photosynthesis, while microalgae are small, unicellular algae. This work focuses exclusively on microalgae, exploring their diversity, cultivation techniques, and applications in aquaculture. These photosynthetic organisms, at the base of the aquatic food chain, are distinguished by their immense biodiversity and adaptability. They play a key role in global primary production, CO<sub>2</sub> capture, and the biosynthesis of valuable compounds, such as omega-3 fatty acids, pigments, and polysaccharides, which are widely used in the aquaculture and food industries. Laboratory experiments conducted allowed for the analysis of their biological and ecological properties, highlighting their role in improving water quality and stimulating growth in aquaculture. Microalgae can be collected using two main methods: the Niskin bottle or a plankton net. Microalgae generally grow within an optimal temperature range of 20°C to 30°C. Under ideal conditions, they can divide every 12 to 24 hours, reaching their exponential phase in 2 to 7 days.

**Keywords** – microalgae, aquaculture, fish farming, sustainable development, cultivation techniques.

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## Free Vibration Analysis of Composite Beams on Visco-Pasternak Foundation Using Higher-Order Theory

Imene HEBBAR<sup>1</sup>, Nabil HEBBAR<sup>2</sup> and Farouk YAHIA ADDOU<sup>3</sup>

<sup>1</sup>Engineering Department, Faculty of Science and Technology, University of Mostaganem, Algeria

<sup>2</sup>Civil Engineering Department, Faculty of Science and Technology, University of Mostaganem, Algeria

<sup>3</sup>Material and Hydrology Laboratory, University of Sidi Bel Abbas, Faculty of Technology, Algeria

[\\*addoufarouk@gmail.com](mailto:*addoufarouk@gmail.com)

**Abstract** –The free vibration behavior of laminated composite beams resting on a visco-Pasternak foundation is investigated using a higher-order shear deformation theory. The composite beam is assumed to be made of elastic fiber-reinforced layers, while the foundation is modeled by viscoelastic Winkler and shear interaction parameters. The governing equations of motion are derived through Hamilton's principle and solved for simply supported boundary conditions. Analytical expressions of the natural frequencies are obtained using an appropriate solution technique. The accuracy of the present formulation is validated by comparison with available results in the literature. A parametric study is finally carried out to examine the influences of material properties, lamination sequence, geometric parameters, and foundation coefficients on the vibration characteristics of composite beams.

**Keywords** – free vibration, visco-Pasternak, hamilton's principle

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## Developing an Optimal Matrix Treatment Strategy for the Haoud Berkaoui Oil Fields -Algeria

Djamila BOUFADES<sup>1</sup>, Zakaria ADJOU<sup>2</sup> and Souad HAMMADOU NÉE MESDOUR<sup>3</sup>

<sup>1</sup>Hydrocarbons production department, Kasdi Merbah university. Ouargla, Algeria

<sup>2</sup>Chemistry department, M'Hamed Bougara university. Boumerdes, Algeria

\*[petrohanane@yahoo.fr](mailto:petrohanane@yahoo.fr)

**Abstract** – Formation damage is a major factor limiting oil recovery in the Haoud Berkaoui (HBK) region –Algeria, often caused by fines migration, salt precipitation, and operations such as workover, completion, and cementation. This damage reduces near-wellbore permeability and flow efficiency. Matrix acidizing is a key method used to remove such damage and restore reservoir productivity. This study analyzes acidizing operations conducted on five wells in the Benkahla (BKH) field, with the primary objective of identifying the most effective and compatible acid system for the reservoir. The second objective is to optimize acid volume calculations using a dual approach: BJSP software, which incorporates porosity and perforation interval, and guideline tables based on permeability and temperature. Historical well data were reviewed, formation damage was identified through field indicators, and PLT and well test results were interpreted to estimate the skin factor and evaluate well performance. Comparing production before and after acidizing revealed significant improvements in most wells. Among the tested systems, acid system AS1 (6% HCl – 1.5% HF) proved the most effective, enhancing permeability while minimizing risks of precipitation and emulsion. In contrast, AS2 and AS3 showed weaker performance. The study validates previous findings, confirming AS1's compatibility with the HBK reservoir. this integrated strategy merging field data, and software modeling provides a technically sound and economically optimized solution for enhancing acidizing effectiveness and maximizing production in the HBK region.

*Keywords* – Formation damage, matrix acidizing, Benkahla field, acid system AS1, BJSP software, permeability, PLT analysis, skin factor, production optimization, economic evaluation

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## Issuance Islamic Sukuk in Algeria: Legal Vacuum of Institutional Deficiencies and Practical Impediments

Zerouki BOUZNE<sup>1</sup>

<sup>1</sup>Department/Research Institute, Faculty of Law and Political Science, University of Oran 2 Mohamed Ben Ahmed, Algeria

<sup>2</sup>Department/Research Institute, University, Country. (ORCID: <https://orcid.org/0009-0003-3766-3748>)

[\\*zeroukibouzned2019@gmail.com](mailto:zeroukibouzned2019@gmail.com)

**Abstract** – In Algeria, the Islamic finance law legislated by provisions of the Bank of Algeria Regulation No. 20-02 dated on March 15, 2020, defining banking operations related to Islamic banking and the rules for their practice by banks and financial institutions offer Sharia-compliant financial instruments. However, the non-stating some internal bodies involved that are required to be enacted to regulate the issuance, listing, trading and redemption of Sukuk is in sight yet as some legal hindrances need to be obstacles and practical constraints in their implementation, Primarily, the absence of Special purpose vehicles (SPVs) that enable the issuance of Sukuk under a legal company financially independent from the originator. The originator which needs the liquidity intended to issue the sukuk for its own financing to investors subscribers, has to do it just through the SPV. SPV is entrusted to the assets transferred to it by the originator for the benefit of Sukuk holders. It is important to establish a centralized SPV for facilitating the issuance of the sovereign Sukuk and identifying the institutions that undertake the commercial and administrative activities. SPV is considered as a proxy to the originator before issuance of sovereign Sukuk in one hand, but a proxy to the sukuk holders after issuing and transferring their ownership to them in other hand in terms of concluding contracts related to the underlying assets, because it is authorized to conclude post-issuance contracts, such as purchase, lease, and guarantee agreements. It is also responsible for receiving and distributing profits to Sukuk holders in proportion to their principal capital. Secondly, non-setting up a litigation body for resolving the disputes relating to Sukuk default.

*Keywords* – Islamic Sukuk, Sharia-compliant products, Islamic finance, Islamic banking, SPVs, entrepreneurship

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## **Sovereign Sukuk in Algeria Legislated by the Finance Ministry Decision Dated on June 1, 2025**

Zerouki BOUZNE<sup>2</sup>

<sup>1</sup>Department/Research Institute, Faculty of Law and Political Science, University of Oran 2 Mohamed Ben Ahmed, Algeria

<sup>2</sup>Department/Research Institute, University, Country. (ORCID: <https://orcid.org/0009-0003-3766-3748>)

[\\*zeroukibouzned2019@gmail.com](mailto:zeroukibouzned2019@gmail.com)

**Abstract** – In Algeria, the Sukuk stated by the provisions of the Law No. 23-09 containing the Monetary and Banking Law issued on June 21, 2023, and explained in the recent Finance Ministry decision dated on June 1, 2025, specifies the procedures for issuing sovereign Sukuk by the Public Treasury offer Sharia-compliant financial instruments designed to stimulate the financial market and support the financing of emerging startups, particularly for young entrepreneurs. These instruments, including Sukuk, provide innovative ways to mobilize capital while adhering to Islamic financial principles. The sector operates under a dual framework of Sharia and significant regulatory structures controls, ensuring both compliance and market stability. Effective implementation of Sharia-compliant products requires alignment between regulatory standards and religious principles elaborated by international sharia committees, for ensuring that financial transactions are both legally secure and ethically sound, especially those of AAOIFI Sharia's Standard (17) on investment Sukuk. However, there is a pressing need for the accreditation of certain regulatory bodies responsible for overseeing the issuance, trading and redemption of Islamic Sukuk, ensuring compliance with both legal and Sharia frameworks.

*Keywords* – Sovereign Sukuk, entrepreneurship, Islamic finance, Islamic banking, AAOIFI Sharia's Standard

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## 3D Numerical Simulation of Seismic Failure of Concrete Gravity Dams Considering Base Sliding

Djamel OUZANDJA<sup>1</sup>

<sup>1</sup>Department of Civil Engineering/Research Laboratory of Materials and Mechanics of Structures (LMMS), Civil Engineering  
Department, Faculty of Technology, University of Msila, Algeria

[\\*djamel.ouzandja@univ-msila.dz](mailto:djamel.ouzandja@univ-msila.dz)

**Abstract** – The present paper presents the seismic cracking behavior of Oued Fodda concrete gravity dam, located in northwestern Algeria, considering base sliding. For purpose, three-dimensional nonlinear finite element analysis is carried out for the Oued Fodda dam-foundation rock system. The smeared crack model with Willam and Warnke failure criterion is used for modeling the dam concrete cracking. The hydrodynamic pressure of the reservoir water is modeled as added mass using the Westergaard approach. The sliding behavior of contractions joints is modeled using by surface-surface contact elements that provide the friction contact in dam-foundation interface. Drucker-Prager model is preferred for dam concrete in nonlinear analysis. According to finite element numerical analysis, several cracks may appear due to tension particularly at middle upper parts located along the symmetry central axis of the dam in both upstream and downstream faces. Although the dam sliding on its foundation reduces the magnitude of principal tensile stresses in dam body; however, the reduction magnitude is generally not large enough to prevent the crack propagation in dam body.

**Keywords** – Concrete gravity dam, sliding, seismic failure, 3D seismic response

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## Evaluation of the Antioxidant Activity of Nettle (*Urtica Dioica*) Using the FRAP Assay

Rahmani IMENE<sup>1</sup>

<sup>1</sup>Central laboratory of the Cancer Centre of Setif, University, Algeria

[\\*rahmanimene19@yahoo.com](mailto:*rahmanimene19@yahoo.com)

**Abstract** – *Urtica dioica*, commonly referred to as nettle, is a medicinal plant well known for its abundant phytochemical profile and broad therapeutic potential. Its bioactive compounds, particularly phenolic constituents, play a key role in scavenging free radicals and protecting against oxidative stress induced damage. The study of these natural antioxidants offers important insights into the health benefits of *Urtica dioica* and supports its potential use in nutraceutical and pharmaceutical applications. The objective of this study is to assess its antioxidant activity using the FRAP assay.

The extraction was carried out by methanolic maceration of the plant's leaves, followed by filtration and evaporation under reduced pressure. The total phenolic content was determined using a colorimetric method (Folin-Ciocalteu test), and the antioxidant activity was assessed using the FRAP (Ferric reducing antioxidant power) assay.

The analysis of phenolic compounds, reported as milligrams of gallic acid equivalents per gram of dry matter, indicated elevated levels. Similarly, the antioxidant activity measured using the FRAP assay, expressed as the median effective concentration (EC<sub>50</sub>) in micrograms of extract per milliliter, demonstrated significant activity.

The results confirm that common nettle is an important natural source of bioactive compounds exhibiting potent free-radical-scavenging activity, supporting its traditional use in managing oxidative stress related conditions.

*Keywords* – Nettle, extract, phenolic compounds, antioxidant, FRAP

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## Research on Digital Skills Empowerment for Low-Skilled Workers by International Organization

Jun JIANG<sup>1</sup>

<sup>1</sup>PhD student, Varna Free University “Chernorizets Hrabar”, Bulgaria

<sup>2</sup>Lecturer in Nantong College of Science and Technology, China

[\\*piercejiangji@126.com](mailto:piercejiangji@126.com)

**Abstract** – As digital transformation reshapes global labor markets, low-skilled workers face heightened risks of exclusion due to limited access to digital skills training and systemic barriers. This paper examines how four major international organizations—the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Labour Organization (ILO), the World Bank, and the European Union (EU)—design and implement strategies to empower low-skilled labor forces through digital upskilling. Through a comparative analysis of policy frameworks, programmatic initiatives, and institutional mechanisms from 2016 to 2025, the study identifies convergent approaches centered on inclusive education, equitable access, labor protection in platform economies, and future-oriented skills forecasting. Findings reveal that effective empowerment hinges on integrating human-centered design, multi-stakeholder collaboration, and adaptive social protection systems. The paper further distills actionable policy insights for national governments, emphasizing the need for coordinated digital skills strategies, investment in flexible learning pathways (e.g., micro-credentials), and regulatory reforms that safeguard gig and informal workers. By synthesizing global best practices, this research contributes to the discourse on building resilient, inclusive, and future-ready workforce ecosystems in an era of rapid technological change.

**Keywords** – Low-skilled Workers, Digital Education and Training, International organizations, Digital inclusion, Lifelong learning, Digital economy

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## The Effects of Climate Change on Genetic Adaptation, Animal Welfare and Production Performance in Dairy Cattle

Ömer ERTEN<sup>1</sup>

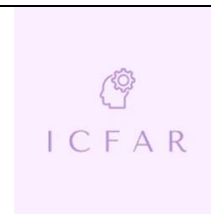
<sup>1</sup>Erzincan Binali Yıldırım University/Kemaliye Hacı Ali Akın Vocational School, Department of Veterinary Medicine,  
Erzincan, Türkiye.

[\\*oerten@erzincan.edu.tr](mailto:oerten@erzincan.edu.tr)

**Abstract** – In dairy cattle farming, global climate change, particularly due to heat stress, is placing increasing pressure on animal health, welfare and productivity. Rising ambient temperatures and humidity levels can have many significant adverse effects, such as reduced milk yield and milk components, decreased fertility, and increased risk of metabolic and infectious diseases. Therefore, enhancing dairy cattle's ability to adapt to heat stress caused by climate change is crucial for sustainable production systems. Heat stress tolerance is a genetically based trait that varies significantly between breeds and genotypes. In recent years, breeding programmes have focused on traits such as heat stress tolerance, longevity, fertility and udder health, in addition to milk yield. Genetically resilient animals exhibit more stable production performance than other animals, even under stressful conditions, and experience less welfare loss. Animal welfare indicators reveal the effects of climate change-related stress on animals. These indicators are measured using parameters such as respiratory rate, body surface temperature, behavioural changes and lameness. There is a direct relationship between these indicators and production performance. Taking into account the interactions between genetic adaptation, animal welfare and production performance provides a more comprehensive approach to developing dairy cattle breeding that is compatible with climate change. Therefore, genetic resilience and welfare-based herd management strategies aim to achieve environmentally sensitive, sustainable production targets in dairy cattle breeding in the future.

*Keywords* – Dairy cattle, genetics, welfare, stress, climate change.

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## Corpus Linguistics: An Empirical Approach to the Study of Language

Mahdid FATIMA ZOHRA<sup>1</sup> and Mahdid KHEIRA<sup>2</sup>

<sup>1</sup>Faculty of Economic, Commercial, and Management Sciences, Bordj Bou Arreridj University, Algeria (ORCID:  
<https://orcid.org/0009-0003-1736-6973>)

<sup>2</sup>Department of Languages and Literature, University M'sila, Algeria

[\\*fatimazohra.mahdid@univ-bba.dz](mailto:*fatimazohra.mahdid@univ-bba.dz)

**Abstract** - Corpus linguistics is an empirical approach to the study of language that is based on the systematic analysis of large collections of authentic texts, commonly referred to as corpora. This paper examines corpus linguistics as a data-driven methodology that enhances the objectivity, reliability, and descriptive adequacy of linguistic research. By relying on naturally occurring language data rather than introspection, corpus linguistics allows researchers to uncover recurrent lexical, grammatical, and discourse patterns that reflect actual language use. The study outlines the theoretical and methodological foundations of corpus linguistics, with particular emphasis on corpus design, representativeness, and balance, as well as the role of computational tools such as concordancers, frequency lists, and collocation analysis.

Furthermore, the paper highlights the integration of quantitative and qualitative methods in corpus-based research, demonstrating how statistical evidence can be interpreted within broader linguistic and communicative contexts. The applicability of corpus linguistics across multiple subfields is also discussed, including applied linguistics, language teaching and learning, translation studies, discourse analysis, and natural language processing. Through these applications, corpus linguistics has contributed to the development of more accurate language descriptions, pedagogical materials, and translation resources.

Despite its methodological strengths, corpus linguistics faces certain challenges, particularly concerning corpus representativeness and the interpretation of large-scale data. Nevertheless, the paper argues that corpus linguistics remains a powerful and indispensable approach in contemporary linguistics. By grounding linguistic analysis in empirical evidence, it continues to reshape both theoretical perspectives and practical applications in the study of language.

*Keywords – Corpus Linguistics, Language Corpora, Empirical Analysis, Authentic Language Use, Corpus-Based Methods*

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## Orijinal Yolov9-M Mimarisine Entegre Edilmek Üzere Basic ve Bottleneck Yapılarını Birleştiren Hibrit Modülün EKG Analizine Etkisi

Fatma AKALIN<sup>1</sup>, Pınar DERVİŞOĞLU ÇAVDAROĞLU<sup>2</sup>, Mehmet FATİH ORHAN<sup>3</sup> ve Arda DOĞU ARI<sup>4</sup>

<sup>1</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-6670-915X>)

<sup>2</sup>Dahili Tıp Bilimleri Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-5726-0362>)

<sup>3</sup>Dahili Tıp Bilimleri Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-8081-6760>)

<sup>4</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye

\*[fatmaakalin@sakarya.edu.tr](mailto:fatmaakalin@sakarya.edu.tr)

**Özet** – Bu çalışma, 14-18 yaş arası sporcular için katılım öncesi kardiyovasküler taramanın mevcut durumunu, zorluklarını ve etkinliğini değerlendirmeyi amaçlamaktadır. Düzenli fiziksel aktivite çocukların fiziksel, ruhsal ve sosyal sağlıkları üzerinde olumlu etkilere sahip olsa da, genç sporcularda ani kalp ölümü (AKÖ) önemli bir halk sağlığı sorunu oluşturmaktadır. Konjenital kalp anomalileri, genetik kardiyomiyopatiler ve kanalopatiler, pediatrik yaş grubunda başlıca etiyolojik faktörler arasındadır. Çocuk ve ergen popülasyonunda kardiyovasküler tarama, büyüme ve gelişmeyle birlikte ortaya çıkan EKG bulgularındaki dinamik değişiklikler nedeniyle ek zorluklar ortaya koymaktadır. EKG'nin belirli yapısal patolojileri ve koroner anomalileri tutarlı bir şekilde tespit edememesi önemli bir sınırlama oluşturmaktadır. Orijinal YOLOv9-m mimarisinin backbone kısmına hibrit bir entegrasyon yapılmıştır. EvoNorm kullanılmış BasicBlock yapısı ve EvoNorm kullanılmış Bottleneck yapısı kapsamında hibrit bir kullanım gerçekleştirilmiştir. EvoHybrid yapısı YOLOv9'a entegre edilmek üzere uygunlaştırılmıştır. Ardından tespit başarımı karşılaştırılmıştır.

Eğitimsiz veya deneyimsiz EKG okuyucuları, yüksek yanlış pozitiflik oranlarına yol açabilir ve bu da gereksiz ek testlere, ekonomik yüke ve olumsuz psikososyal sonuçlara yol açabilir. Türkiye gibi genç nüfusa sahip ülkelerde, ulusal, standart tarama protokollerinin geliştirilmesi, yerel epidemiyolojik verilere dayalı algoritmaların oluşturulması ve yapay zekâ tabanlı yorumlama sistemlerinin entegrasyonu büyük önem taşımaktadır. Bu çalışma, Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) tarafından 124E599 numaralı proje kapsamında desteklenmiştir. Yazarlar destekleri için TÜBİTAK'a teşekkürlerini sunar.

**Anahtar Kelimeler** – Ani kardiyak ölüm, sporda katılım öncesi tarama, elektrokardiyografi, EvoNorm kullanılmış BasicBlock yapısı, EvoNorm kullanılmış Bottleneck yapısı, YOLOv9'a entegre edilen hibrit modül



## Orijinal Yolov9-M Mimarisine Entegre Edilen Multi-Head Attention Yapısının EKG Analizine Etkisi

Fatma AKALIN<sup>1</sup>, Pınar DERVİŞOĞLU ÇAVDAROĞLU<sup>2</sup>, Mehmet FATİH ORHAN<sup>3</sup> ve Arda DOĞU ARI<sup>4</sup>

<sup>1</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-6670-915X>)

<sup>2</sup>Dahili Tıp Bilimleri Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-5726-0362>)

<sup>3</sup>Dahili Tıp Bilimleri Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-8081-6760>)

<sup>4</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye

\*[fatmaakalin@sakarya.edu.tr](mailto:fatmaakalin@sakarya.edu.tr)

**Özet** – Pediatrik spor kardiyolojisi alanında, özellikle elektrokardiyogram (EKG) kullanımını olmak üzere, katılım öncesi kardiyovasküler değerlendirme protokolleri konusunda önemli tartışmalar devam etmektedir. Evrensel EKG taraması, erişim, eşitlik ve kaynaklar konusunda endişelere yol açmaktadır. Bu durum, değerlendirme protokollerinin yeniden incelenmesini gerektirmektedir. Bu çalışma, çocuklarda katılım öncesi EKG analizinin rolünü, faydalarını, risklerini ve gelecek perspektiflerini güncel bilimsel kanıtlar ışığında kapsamlı bir şekilde değerlendirmeyi ve Türkiye bağlamında öneriler geliştirmeyi amaçlamaktadır. Son yıllarda, bu tartışma belirli temel noktalarda birleşerek önemli bir evrim geçirmiştir. 2020'lerde yayımlanan güncellenmiş kılavuzlar, daha önceki katı tutumları yumuşatarak daha bütüncül ve bağlama duyarlı modeller önermiştir. Bu çalışmada değerlendirme sürecini yapay zeka tabanlı bir formatta analiz etmek için YOLOv9 mimarisi kullanılmıştır. Ardından performansı optimize etmek amacı ile YOLOv9-m yaklaşımına entegre edilen Multi-Head Attention modülü entegre edilmiştir. Ardından yanlış tespit oranındaki performansı incelenmiştir. Bu çalışma, Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) tarafından 124E599 numaralı proje kapsamında desteklenmiştir. Yazarlar destekleri için TÜBİTAK'a teşekkürlerini sunar.

**Anahtar Kelimeler** – 14-18 yaş arası elektrokardiyogram ölçümü, YOLOv9'a entegre edilen multi head attention yapısı, yapay zeka tabanlı analiz



## Tunable Electronic, Magnetic, Thermoelectric, and Photovoltaic Properties of Dodecagonal Graphene

R. MASROUR<sup>1</sup>

<sup>1</sup>Laboratory of Solid Physics, Faculty of Science, Sidi Mohamed Ben Abdellah University, Dhar Mahraz, BP 1796, Fez,  
Morocco

\*[rachidmasrou@hotmai.com](mailto:rachidmasrou@hotmai.com)

**Abstract** – Two-dimensional dodecagonal graphene possesses unique geometric and electronic properties, making it a promising material for applications such as water purification, optoelectronics, gas sensing, thermoelectric energy conversion, and photovoltaic devices. Although the pristine structure is a non-magnetic semiconductor, the introduction of point defects and dopants markedly alters its electronic and magnetic behavior, with direct implications for thermoelectric and photovoltaic performance. Dopants from groups IIIA and VA induce metallic and magnetic characteristics, whereas group IVA dopants preserve the semiconducting and non-magnetic nature. First-principles DFT calculations demonstrate the tunability of the electronic, magnetic, thermoelectric, and photovoltaic properties of dodecagonal graphene, underscoring its potential for spintronic and nanoelectronic applications.

**Keywords** – Dodecagonal graphene, Density functional theory, Doping and defects, Thermoelectric properties, Photovoltaic applications

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## Heterojunction-Engineered Double Perovskite Phosphors for Enhanced Optoelectronic and Photovoltaic Performance

R. MASROUR<sup>1</sup>

<sup>1</sup>Laboratory of Solid Physics, Faculty of Science, Sidi Mohamed Ben Abdellah University, Dhar Mahraz, BP 1796, Fez, Morocco

\*[rachidmasrou@hotmai.com](mailto:rachidmasrou@hotmai.com)

**Abstract** – The luminescent performance of lanthanide-doped phosphors is strongly governed by the host lattice, making them attractive for optoelectronic and photovoltaic applications. Double perovskite materials combined with heterojunction engineering provide an effective route to enhance optical efficiency and charge-carrier dynamics. In this work, a Ba<sub>2</sub>LuNbO<sub>6</sub>/LuNbO<sub>4</sub> heterojunction was formed via Ba<sup>2+</sup> nonstoichiometry in Dy<sup>3+</sup>-doped Ba<sub>2</sub>LuNbO<sub>6</sub>, resulting in pronounced enhancements of photoluminescence and radioluminescence by factors of 31.5 and 141.4, respectively. These improvements originate from interfacial charge transfer and oxygen-vacancy-assisted recombination, which are also beneficial for optoelectronic and photovoltaic performance. The proposed strategy is extendable to Eu<sup>3+</sup> and Sm<sup>3+</sup> dopants, offering a general pathway for developing high-efficiency perovskite-based optoelectronic and photovoltaic materials.

**Keywords** – Double perovskite phosphors, Heterojunction engineering, Lanthanide doping, Optoelectronic properties, Photovoltaic applications

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## DFT Investigation of the Electronic, Optoelectronic, and Photovoltaic Properties of Lead-Free $\text{Na}_{0.2}\text{Bi}_{0.3}\text{Zr}_{0.5}\text{TiO}_2$ Ceramic

R. MASROUR<sup>1</sup>

<sup>1</sup>Laboratory of Solid Physics, Faculty of Science, Sidi Mohamed Ben Abdellah University, Dhar Mahraz, BP 1796, Fez, Morocco

\* [rachidmasrou@hotmai.com](mailto:rachidmasrou@hotmai.com)

**Abstract** – The lead-free ceramic,  $\text{Na}_{0.2}\text{Bi}_{0.3}\text{Zr}_{0.5}\text{TiO}_2$  was investigated using first-principles density functional theory. Calculations revealed a mixed-phase-like electronic structure and suggested a phase transition near room temperature. density functional theory -derived analyses of AC-conductivity and complex impedance indicate non-Debye relaxation and a negative temperature coefficient of resistance. Additionally, the material exhibits promising optoelectronic and photovoltaic properties, with the Fermi level and activation energy providing insight into charge transport and light-harvesting potential of  $\text{Na}_{0.2}\text{Bi}_{0.3}\text{Zr}_{0.5}\text{TiO}_2$ .

**Keywords** –  $\text{Na}_{0.2}\text{Bi}_{0.3}\text{Zr}_{0.5}\text{TiO}_2$ , Density functional theory, Optoelectronic properties, Photovoltaic performance, Electrical conductivity

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## Second-Order Generalizations of Special Functions

Rahaf HABIBA<sup>1</sup> and Nihal ÖZDOĞAN<sup>2</sup>

<sup>1</sup>Department of Mathematics, Postgraduate Education Institute, Bursa Technical University, Turkey

<sup>2</sup>Department of Mathematics, Faculty of Engineering and Natural Sciences, Bursa Technical University, Turkey

[\\*rahaf.habiba33@gmail.com](mailto:rahaf.habiba33@gmail.com)

**Abstract** – This study deals with new generalizations of the following special functions. The generalized special functions are defined in the form as

$$\begin{aligned}\Psi_{\phi} \Gamma_R^{(\alpha, \beta, \mu, \kappa)}(x) &= \int_0^{\infty} t^{x-1} \Psi \Phi_p^{(\alpha, \beta)}\left(\mu, \kappa; -t - \frac{R}{t}\right) dt \\ \Psi_{\phi} B_R^{(\alpha, \beta, \mu, \kappa)}(x, y) &= \int_0^1 t^{x-1} (1-t)^{y-1} \Psi \Phi_p^{(\alpha, \beta)}\left(\mu, \kappa, -\frac{p}{t(1-t)}\right) dt \\ \Psi_{\phi} F_R^{(\alpha, \beta, \mu, \kappa)}(a, b; c; z) &= \sum_{n=0}^{\infty} \frac{\Psi_{\phi} B_R^{(\alpha, \beta, \mu, \kappa)}(b+n, c-b)}{B(b, c-b)} (a)_n \frac{z^n}{n!}; |z| < 1 \\ \Psi_{\phi} \Phi_R^{(\alpha, \beta, \mu, \kappa)}(b; c; z) &= \sum_{n=0}^{\infty} \frac{\Psi_{\phi} B_R^{(\alpha, \beta, \mu, \kappa)}(b+n, c-b)}{B(b, c-b)} \frac{z^n}{n!}\end{aligned}$$

These generalizations are constructed based on a previously introduced generalization of the confluent hypergeometric function given by

$$\Psi \Phi_p^{(\alpha, \beta)}(b; c; z) = \frac{1}{B(b, c-b)} \int_0^1 t^{b-1} (1-t)^{c-b-1} e^{zt} {}_0\Psi_1\left(\alpha, \beta; -\frac{p}{t(1-t)}\right) dt$$

The main purpose of this work is to study the fundamental properties of the new generalized functions. In particular, integral representations, derivative formulas, and Mellin transforms associated with the proposed generalizations are presented. The results obtained extend several known results in the literature and provide guidance for further studies in applied analysis and special functions.

*Keywords* – Gamma function, Beta function, Gauss hypergeometric function, Confluent hypergeometric function, Wright function



## Renk Körü Bireylerin Web Erişilebilirliğindeki Kapsayıcı Dijital Deneyim İçin Tasarım Gereklilikleri

Fatma AKALIN<sup>1</sup> ve Mehmet FATİH ORHAN<sup>2</sup>

<sup>1</sup>Bilişim Sistemleri Mühendisliği Bölümü, Sakarya Üniversitesi, Türkiye

<sup>2</sup>Tıp Fakültesi, Sakarya Üniversitesi, Türkiye

\*[fatmaakalin@sakarya.edu.tr](mailto:fatmaakalin@sakarya.edu.tr)

**Özet** —Göz; karmaşık optik ve sinirsel süreçlerin birbirine entegre olduğu bir yapıdır. Çevresel bilgileri algılar. Ardından bu bilgileri beyne ileterek işlenmesi ve yorumlanması ile anlamlı görüntü oluşumunu sağlar. Bu organımızın renk tonlarını ayırt etme yeteneği genetik ve kalıtsal bir bozukluk olan renk körlüğü nedeni ile bozulabilir. Bunun sonucunda günlük yaşamda birçok zorluk oluşmaktadır. Örneğin, renk körlüğü olan kişiler, trafik ışıklarını, grafikleri, sanat eserlerini algılama sürecinde zorluk çekebilirler. Öte yandan web içeriklerine ulaşma ve anlamlandırma süreçleri de zorlaşır. Web tasarımcıları ve geliştiriciler, erişilebilirlik standartlarına uymak suretiyle renk körlüğü olan kullanıcıların da çeşitli bilgileri ve hizmetleri kolayca alabilmeleri için kapsayıcı bir dijital deneyim sunmayı hedeflemelidir. Çünkü web siteleri genellikle geniş kitlelere hitap eder. Bu doğrultuda renk körlüğü kullanıcı grubuna yönelik çözümler üretilerek daha sağlıklı ve kaliteli erişim olanağı sağlanmalıdır. Web deneyimini çözme ihtiyacı, kullanıcıların çeşitli engel ve zorluklara rağmen interneti etkili bir şekilde kullanabilmeleri için önemlidir. Gelecekte web alanı başta olmak üzere android ve ios tabanlı cihazlarda da bu ihtiyacın göz önüne alınması gelişen dijital dünyada gittikçe önem kazanacaktır.

*Anahtar Kelimeler – Renk körlüğü, Web erişilebilirliği, Dijital kapsayıcılık, Erişilebilirlik standartları, Kullanıcı deneyimi*





## Renk Körü Kullanıcılar İçin Web Tasarımında Erişilebilirlik

Fatma AKALIN<sup>1</sup>, Dilara TOP<sup>2</sup> ve Esmâ KARA<sup>3</sup>

<sup>1</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-6670-915X>)

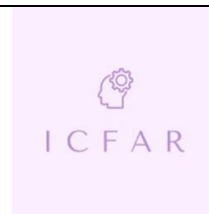
<sup>2</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye

<sup>3</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye

\*[fatmaakalin@sakarya.edu.tr](mailto:fatmaakalin@sakarya.edu.tr)

**Özet** – Renk körlüğü, X kromozomuna bağlı kalıtsal bir bozukluk olup, dünya genelinde erkeklerin yaklaşık %8'ini ve her 200 kadından 1'ini etkilemektedir. Bu çalışmanın amacı, renk körlüğü olan bireylerin web içerikleri ve dijital tasarımları kullanırken karşılaştıkları erişilebilirlik sorunlarını incelemek ve tasarımcılara pratik çözüm önerileri sunmaktır. Çalışmada, renk algısı, koni hücrelerinin işlevleri ve renk körlüğünün farklı türleri ele alınmıştır. Bu bağlamda renk algısında yaşanan yanlısamlar açıklanmıştır. Renk algısı, retinada bulunan üç farklı tip koni hücrelerinin (kısa, orta ve uzun dalga boylarına duyarlı) işlevlerine bağlıdır. Bu koni hücrelerinden bir veya birkaçının eksikliği ya da işlev bozukluğu, renk körlüğünün farklı türlerine (monokromatik, dikromatik ve anormal trikromatik) yol açmaktadır. Bulgular, renk körlüğü olan kullanıcıların özellikle benzer açıklığa sahip renkleri ayırt etmekte, kırmızı-yeşil kombinasyonlarını algılamakta ve renk kodlamasına dayalı bilgileri anlamakta zorluk yaşadığını ortaya koymuştur. Monokromatik renk şemalarının renk körü kullanıcılar için erişilebilir olduğu, ancak koyu renklerin siyahla birlikte kullanılmasının ayırt edilebilirliği azalttığı belirlenmiştir. Çalışma sonucunda, web tasarımında erişilebilirliği artırmak için şu öneriler geliştirilmiştir: ön plan ve arka plan arasında güçlü kontrast oluşturma, monokromatik renk şemalarını tercih etme, yalnızca renge dayalı bilgi aktarımından kaçınarak sembol ve desen kullanma, ton-doygunluk-açıklık özelliklerinde belirgin farklılıklar sağlama. Bu önerilerin uygulanması ile renk körü kullanıcılarına dijital içeriklere eşit şekilde erişebilme imkanı için kapsayıcı bir kullanıcı deneyimi sunulacaktır.

*Anahtar Kelimeler - Renk körlüğü, Web Erişilebilirliği, Kullanıcı Arayüz Tasarımı, Renk Algısı, Renk Kontrastı*



## Preparation and Biological Screening of Hydrazones Using Isolated Cholic Acid

Talha MASHHOOD<sup>1</sup>, Akbar ALI<sup>2</sup>, Shehar BANO<sup>3</sup> and Muhammad IBRAHIM<sup>4</sup>

<sup>1</sup>Applied Chemistry, Government College University Faisalabad, Pakistan

<sup>2</sup>Chemistry, Government College University Faisalabad, Pakistan

<sup>3</sup>Applied Chemistry, Government College University Faisalabad, Pakistan

<sup>4</sup>Applied Chemistry, Government College University Faisalabad, Pakistan

[\\*talhamashhood@gmail.com](mailto:*talhamashhood@gmail.com)

**Abstract** – Natural product modification is one of the key areas of synthetic organic chemistry for the accomplishment of valuable chemical building blocks that have prized medicinal significance. Hydrazones possess an azomethine (-NHN=CH-) group and are considered derivatives of aldehydes and ketones in which the oxygen atom has been replaced by the (R-NHN=C) functional group. These are widely studied molecules owing to their ease of preparation and diverse medicine, agriculture and pharmacology potential. Herein, cholic acid based hydrazones were synthesized and characterized using spectroscopic techniques. The newly synthesized cholic acid based hydrazones were screened for their anticancer and antioxidant potential. Antioxidants showed their activity by inhibiting the oxidative chain reactions that produce reactive oxygen species. The antioxidant activity showed that 4-NBCH exhibited the maximum DPPH inhibitory activity when compared with other synthesized compounds. The compound purified by thin-layer chromatography and column chromatography. Characterized by Ultra-Violet Visible Spectroscopy, Infra-red, Mass Spectrometry and Nuclear Magnetic Resonance Spectroscopy. Finally, the synthesized compound tested for its biological activities like anti-microbial, anti-oxidant and anti-cancer.

**Keywords** – Cholic acid, Anti-microbial, Anti-oxidant, DFT Study, Spectroscopic Analysis

## Synthesis and Biological Screening of Amides Using Coumarin-3-Carboxylic Acid

Shehar BANO<sup>1</sup>, Muhammad IBRAHIM<sup>2</sup>, Talha MASHHOOD<sup>3</sup> and Akbar ALI<sup>4</sup>

<sup>1</sup>Applied Chemistry, Government College University Faisalabad, Pakistan

<sup>2</sup>Applied Chemistry, Government College University Faisalabad, Pakistan

<sup>3</sup>Applied Chemistry, Government College University Faisalabad, Pakistan

<sup>4</sup>Chemistry, Government College University Faisalabad, Pakistan

[\\*sheharchem@gmail.com](mailto:sheharchem@gmail.com)

**Abstract** – Primary, secondary, and tertiary amides have been synthesized by one-pot synthesis from coumarin-3-carboxylic acid by using SOCl<sub>2</sub> and triethyl amine which have significant importance in the pharmaceutical field in the scenario of having biological activities like antimicrobial and anti-oxidants in the priority list. Reaction results are admirable at low temperature and can be pure by washing or column chromatography/preparative column chromatography. Amides are widespread in biologically active compounds with various applications in biotechnology, agriculture and medicine. Herein, Coumarin 3 Carboxylic acid based amides N-(2-hydroxyethyl)-2-oxo-2H-chromene-3-carboxamide (EACA), N-(4-fluorophenyl)-2-oxo-2H-chromene-3-carboxamide (4FCA), N-(3-ethylphenyl)-2-oxo-2H-chromene-3-carboxamide (3EACA), N-(2-chloro-5-nitrophenyl)-2-oxo-2H-chromene-3-carboxamide (2C5NCA), N-(3-fluorophenyl)-2-oxo-2H-chromene-3-carboxamide and N-(3-chloro-4-fluorophenyl)-2-oxo-2H-chromene-3-carboxamide were synthesized and characterized using spectroscopic techniques. The newly synthesized coumarin 3 carboxylic acid based amides were screened for their antibacterial and antioxidant potential. Antioxidants showed their activity by inhibiting the oxidative chain reactions that produce reactive oxygen species. The antioxidant activity showed that 2C5NCA exhibited the maximum DPPH inhibitory activity when compared with that of EACA, 4FCA, 3EACA, 3FCA, and 3C4FCA. While 3C4FCA showed maximum antibacterial activity (E.coli) as compared to other synthesized amides, while in the scenario of S aureus, 3FCA showed maximum activity as compared to 4FCA, EACA, 3EACA, 3C4FCA, and 2C5NCA. By this method, a series of novel coumarin-3-carboxamides were designed and synthesized to evaluate their biological activities.

**Keywords** – Coumarin-3-carboxamides, Anti-microbial, Anti-oxidant, DFT Study, Spectroscopic Analysis



## Görme Algısı Optimizasyonu ve WCAG Kılavuzuna Uygunlaştırma

Fatma AKALIN<sup>1</sup>, Esmâ KARA<sup>2</sup> ve Dilara TOP<sup>3</sup>

<sup>1</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye (ORCID: <https://orcid.org/0000-0001-6670-915X>)

<sup>2</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye

<sup>3</sup>Bilişim Sistemleri Mühendisliği Bölümü / Sakarya Üniversitesi, Türkiye

[\\*fatmaakalin@sakarya.edu.tr](mailto:fatmaakalin@sakarya.edu.tr)

**Özet** – İnsan vücudunun en karmaşık organlarından biri olan ve görme sürecinin başlangıcı olan göz, katmanlı bir yapıdan oluşur. Bu katmanlı yapı sayesinde nesnenin üzerine düşen ışık, gözde gerçekleşen belirli aşamalardan geçer ve bunun sonucunda üretilen ham bilgiler beynin ilgili bölümüne aktararak görme işlemi gerçekleşir. Görme işleminin olması gerektiği gibi gerçekleşmediği durumlar görme bozuklukları altında değerlendirilir. Geçmiş zamanlardan bu yana görme bozukluklarına karşı bazı toplumsal düzenlemeler ve tedavi yöntemleri geliştirilmiştir. Bu durumlardan bazıları teknolojiyi de kapsamaktadır.

Renk körlüğü, ışık hassasiyeti, kontrast hassasiyeti gibi çeşitli göz sorunları yaşayan bireyler göz önüne alındığında bu bireylerin görme algısında farklılıklar olduğu değerlendirilmesi yapılmaktadır. Bununla birlikte ekran üzerinde yer alan piksel seviyesindeki renklerin kombinasyonu veya renk algısında yapılan düzenlemeler ile görme ve renkleri ayırt edebilme düzeyinde gerçekleştirilecek iyileştirmelerin potansiyel mümkün olduğu ifade edilebilir. Pikseller; renklerin derinliği, tonu, doygunluğu, açıklığı ayarlamayı sağlar. Bu sebeple ekran üzerindeki renkler, görme üzerinde azımsanamayacak şekilde optimize etme gücüne sahiptir. Bu kapsamda kullanılacak WCAG kılavuzu, renk ayarlamaları için önemli bir şablon çizer ve anlaşılabilirliği mümkün kılar. WCAG kılavuzu, hem görme bozukluklarına sahip bireyler hem de kalan tüm kullanıcılar için web içeriklerinin erişilebilirliğinin ve anlaşılabilirliğinin kolaylaştırılması adına hazırlanmıştır ve kullanımı teşvik edilmektedir.

*Anahtar Kelimeler – Göz, Görme, Görme Bozuklukları, Piksel, WCAG kılavuzu*

## Natural Adsorbents for Heavy Metal Remediation: Comparative Study of Co(II) and Ni(II) Uptake by Chitosan and Marne Clay

Imane Lansari<sup>1</sup>, Khadidja Tizaoui<sup>2</sup>, Belkacem Benguella<sup>3</sup> and Hasna Boudghene Stambouli<sup>4</sup>

<sup>1</sup>Inorganic Chemistry and Environment Laboratory, University of Tlemcen, Tlemcen 13000, Algeria

<sup>2</sup>Laboratory of Materials Chemistry, Catalysis and Environment, Faculty of Chemistry USTHB El Alia, Algiers 16111, Algeria

[\\*imane.lansari@univ-tlemcen.dz](mailto:imane.lansari@univ-tlemcen.dz)

**Abstract** – Heavy metal contamination of aquatic systems remains a critical environmental challenge due to the toxicity, persistence, and non-biodegradable nature of metal ions. Among the various remediation techniques, adsorption has emerged as a highly efficient, cost-effective, and environmentally friendly approach, particularly when natural adsorbents are employed. This study presents a comparative evaluation of cobalt Co(II) and nickel Ni(II) removal from aqueous solutions using two low-cost materials: natural marne clay and biopolymeric chitosan.

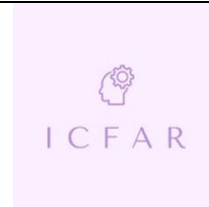
Batch adsorption experiments reported in the selected studies demonstrate that both adsorbents exhibit a strong affinity toward Co(II) and Ni(II), with rapid uptake and equilibrium attained within a relatively short contact time. Adsorption kinetics for both materials are well described by the pseudo-second-order model, indicating that surface interactions and active site availability govern the sorption process. The adsorption behavior is strongly influenced by physicochemical parameters such as pH, initial metal concentration, and temperature.

Chitosan shows enhanced metal binding efficiency due to the presence of amino and hydroxyl functional groups, which promote metal complexation, whereas marne clay benefits from its high specific surface area and cation exchange capacity. In both systems, Co(II) exhibits preferential adsorption compared to Ni(II), reflecting differences in ionic properties and metal–surface interactions. Thermodynamic analyses suggest that the adsorption processes are spontaneous and mainly physical or physico-chemical in nature, depending on the adsorbent.

Overall, the comparative assessment highlights the complementary advantages of chitosan and natural clay as sustainable and efficient materials for the removal of Co(II) and Ni(II) from contaminated water, supporting their potential application in wastewater treatment technologies.

*Keywords* – Heavy metals, chitosan, marne clay, adsorption, Nickel, Cobalt.

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## The Digital Revolution in Management and Its Impact on Business Strategies

Amal ALGOUTI<sup>1</sup>

<sup>1</sup>*Faculté des sciences juridiques, économiques et sociales de Marrakech*

[\\*a.algouti5678@uca.ac.ma](mailto:a.algouti5678@uca.ac.ma)

**Abstract** – In a context marked by rapid digital transformation, driven by the emergence of new technologies, companies are now forced to adapt their organizational processes and strategies. This adaptation also includes enhancing the technological skills of their employees to ensure long-term sustainability. Digitalization is evolving at a fast pace, requiring organizations to maintain a high level of agility and flexibility in rethinking their value creation methods. This research is based on an extensive literature review, relying on academic sources such as scientific articles, specialized books, and online expert contributions. The aim is to deepen the understanding of the specific dimensions of digitalization. First, we will clarify the concept of digital transformation, highlighting emerging technologies like AI. Then, we will identify the main factors that drive this transformation, in relation to the improvement of business performance. We will also address the challenges to overcome as well as the opportunities in this context. Finally, we will propose a structured model to facilitate the successful implementation of digital transformation. The literature analysis allowed us to develop a conceptual model to guide our work. It emerged that digital technology, skills and leadership, as well as a clear digital strategy, are essential levers in the digital transformation process. All these elements have a significant impact on the overall performance of the company.

*Keywords* – digital, transformation, digitalization, AI, technology

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## Seismic Modeling and Analysis of a Five-Story Reinforced Concrete Building

Rahli ROUMAÏSSA<sup>1</sup> and Rahli HIBAT ALLAH<sup>2</sup>

<sup>1</sup>Civil engineering Department, Badji Mokhtar Annaba University, Algeria

<sup>2</sup>Chemistry Department, Badji Mokhtar Annaba University, Algeria

[\\*roumaissa.rahli@yahoo.com](mailto:roumaissa.rahli@yahoo.com)

**Abstract** – Structural modeling has become an essential tool in civil engineering for ensuring the safety and performance of modern buildings. This presentation describes a study on the modeling and structural analysis of a five-story reinforced concrete building using ETABS software. The main objective is to evaluate the building's structural behavior under permanent loads, live loads, and seismic loads, in accordance with applicable design standards. The building's geometry, material properties, boundary conditions, and various load cases are defined within the ETABS environment. The results obtained, including displacements, internal forces, and verification of structural elements such as columns, beams, and shear walls, allow for the evaluation of the overall stability and safety of the structure. This study highlights the effectiveness of ETABS software as a decision-support tool for design.

**Keywords** – Structural modeling, Building, ETABS

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## Study of Lithium-Ion Combinations for Battery Optimization

Rahli HIBAT ALLAH<sup>1</sup> and Rahli ROUMAÏSSA<sup>2</sup>

<sup>1</sup>Chemistry Department, Badji Mokhtar Annaba University, Algeria

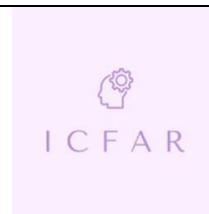
<sup>2</sup>Civil engineering Department, Badji Mokhtar Annaba University, Algeria

[\\*roumaïssa.rahli@yahoo.com](mailto:*roumaïssa.rahli@yahoo.com)

**Abstract** – Lithium-ion batteries play a central role in energy storage due to their high energy density, long lifespan, and high efficiency. This study analyzes different lithium-ion material combinations, particularly cathode-anode pairs, to improve the electrochemical performance of batteries. Cathode materials such as lithium cobalt oxide, lithium iron phosphate, and nickel manganese cobalt oxides are compared in terms of capacity, thermal stability, and cost. On the anode side, graphite and silicon-based materials are studied for their influence on capacity and cycle life. The results show that the choice of material combination plays a crucial role in optimizing the safety, lifespan, and overall performance of lithium-ion batteries. This study contributes to the development of more efficient energy storage solutions adapted to modern applications such as electric vehicles and power systems.

**Keywords** – Lithium-ion, batteries, Cathode materials

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## The Photodegradation of Malachite Green (MG) by New Material Fewo<sub>4</sub>

Boudghene STAMBOULI HASNA<sup>1</sup>, Guenfoud FOUAD KARAOUZENE<sup>2</sup>, Karaouzane GHERBI  
FAYZA KHADIDJA<sup>3</sup> and Lansari IMANE<sup>4</sup>

<sup>1</sup>Laboratory of Inorganic Chemistry and Environment, Department of chemistry, Faculty of sciences, University of Abou bekr BELKAID, TLEMCEEN, ALGERIA.

<sup>2</sup>Laboratory of Spectrochemistry and Analytical Methods, Department of chemistry, Faculty of sciences, University of Abou bekr BELKAID, TLEMCEEN, ALGERIA.

\*[hasna.stambouli@gmail.com](mailto:hasna.stambouli@gmail.com)

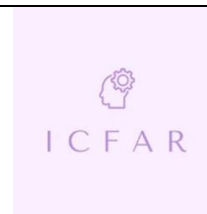
\*[fchemist@hotmail.com](mailto:fchemist@hotmail.com)

\*[mekidz16@gmail.com](mailto:mekidz16@gmail.com)

\*[imanelansari93@gmail.com](mailto:imanelansari93@gmail.com)

**Abstract** - Catalytic photodegradation or photocatalytic process is a very promising alternative for the elimination of soluble organic compounds, by leading to their total mineralization into carbon dioxide, water and mineral acids, in soft conditions of pressure and temperature. Photocatalytic process using semi-conductor nanoparticles has received considerable attention for the degradation and mineralization of various organic pollutants (dyes, phenols, pesticides and pharmacology products) in aqueous media. Synthesis and characterization of mixed oxide FeWO<sub>4</sub> as a photocatalyst in the photodegradation of malachite green (MG) by UV irradiation at 254 nm in a closed reactor was performed. The synthesis was carried out by the sol-gel method (or the citric acid sol-gel method) at room temperature using sodium tungstate(VI) and iron(II) sulfate as precursors. Characterization of the photocatalyst was performed using X-ray diffraction (XRD), FT-IR spectrometry, Scanning electron microscopy coupled with energy dispersive X-ray spectroscopy (SEM-EDXS), BET and X-ray fluorescence (XRF) methods. In order to assess its effectiveness in the degradation of MG, various photo-catalytic tests were carried out. The results obtained showed that the oxide prepared by the sol-gel method has more interesting photocatalytic properties and that the acidity of the medium accelerates the photo-degradation, the optimal conditions were determined such as strongly acidic (pH = 3), and [FeWO<sub>4</sub>] = 0.5 g L<sup>-1</sup> with the rate constant k equal to 0.068 min<sup>-1</sup>.

**Keywords** - FeWO<sub>4</sub> catalyst, Sol-gel method, Photocatalysis, Malachite green



## Photocatalytic Degradation of Pharmaceutical Pollutant: An Approach for Water Treatment

Tizaoui KHADIDJA<sup>1</sup> and Lansari IMANE<sup>2</sup>

<sup>1</sup>Laboratory of Materials Chemistry, Catalysis and Environment, Faculty of Chemistry USTHB El Alia, Bab Ezzouar, PO Box 32, 16111 Algiers, Algeria

<sup>2</sup>Inorganic Chemistry and Environment Laboratory, University of Tlemcen, P. O. Box 119, 13000 Tlemcen, Algeria.

[\\*khadidja.tizaoui@hotmail.fr](mailto:khadidja.tizaoui@hotmail.fr)

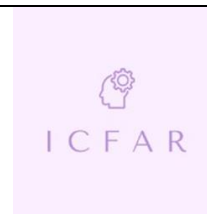
**Abstract** – The occurrence of pharmaceutical residues in aquatic environments has become a growing environmental concern due to their continuous release from wastewater treatment plants and pharmaceutical effluents. Prednisone, a commonly prescribed anti-inflammatory drug, is of particular interest because of its biological activity and environmental persistence, which may pose potential risks to aquatic ecosystems and human health.

In the present study, the photocatalytic degradation of prednisone in aqueous solution was investigated using zinc oxide (ZnO) as a semiconductor photocatalyst under ultraviolet irradiation. ZnO was synthesized and thoroughly characterized by thermogravimetric analysis (TGA), X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), and Brunauer–Emmett–Teller (BET) surface area analysis to elucidate its structural, morphological, and surface properties. The influence of key operational parameters, including catalyst loading and initial pollutant concentration, was systematically evaluated in order to determine the optimal conditions for photocatalytic performance.

The degradation process was monitored by UV–visible spectrophotometry, allowing the temporal evolution of prednisone concentration to be assessed. Under UV irradiation at 365 nm, the photocatalytic system exhibited a significant degradation efficiency, reaching up to 60% after 300 minutes of treatment. The results demonstrate the effectiveness of ZnO as a low-cost and environmentally friendly photocatalyst for the removal of pharmaceutical contaminants from water. Overall, this study highlights the potential of ZnO-based photocatalytic processes as a promising and sustainable approach for the mitigation of emerging pharmaceutical pollutants in aquatic environments.

**Keywords** – Pharmaceutical pollutant, wastewater, Photocatalysis, degradation.

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## Adsorption of a Textile Dye From Aqueous Solution on Natural and Modified Sawdust

Imane LANSARI<sup>1</sup>, Khadidja TIZAOU<sup>2</sup>, Belkacem BENGUELLA<sup>3</sup> and Hasna BOUDGHENE STAMBOULI<sup>4</sup>

<sup>1</sup>*Inorganic Chemistry and Environment Laboratory, University of Tlemcen, Tlemcen 13000, Algeria*

<sup>2</sup>*Laboratory of Materials Chemistry, Catalysis and Environment, Faculty of Chemistry USTHB El Alia, Algiers 16111, Algeria*

[\\*imane.lansari@univ-tlemcen.dz](mailto:imane.lansari@univ-tlemcen.dz)

**Abstract** – Natural and chemically modified sawdust were investigated as low-cost adsorbents for the removal of the textile dye Acid Green 4G from aqueous solutions. A comprehensive physicochemical characterization of both adsorbents was carried out using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), scanning electron microscopy (SEM), Brunauer–Emmett–Teller (BET) surface area analysis, and determination of the point of zero charge (pHpzc). These analyses provided valuable insights into the surface properties, structural features, and functional groups involved in the adsorption process.

Batch adsorption experiments were performed to evaluate the influence of key operational parameters, including contact time, initial dye concentration, and temperature. The adsorption process exhibited a rapid initial uptake followed by a slower approach to equilibrium, which was reached after approximately 120 minutes. Kinetic analysis demonstrated that the experimental data were best described by the pseudo-second-order kinetic model, indicating that adsorption was governed by the availability of active sites on the adsorbent surface.

Comparative results revealed that the modified sawdust exhibited a significantly higher adsorption capacity toward Acid Green 4G than the natural material, highlighting the beneficial effect of surface modification. Equilibrium adsorption data were analyzed using Langmuir and Freundlich isotherm models, with the Freundlich model providing a better fit, suggesting multilayer adsorption on a heterogeneous surface. Thermodynamic investigations indicated that the adsorption of Acid Green 4G onto both adsorbents was endothermic in nature.

Overall, the findings confirm that modified sawdust is a more efficient and practical adsorbent than natural sawdust for the treatment of dye-contaminated wastewater, offering a sustainable and cost-effective solution for textile effluent remediation.

*Keywords* – Textile dye, adsorption, wastewater, sawdust

## Enhancing Global Buckling of I-Shaped Steel Beams with Transverse Stiffeners

Hassina ZIOU<sup>1</sup>, Yacine BAKHTAOUI<sup>2</sup> and Ilies GUENDOUI<sup>3</sup>

<sup>1</sup>National Centre of Integrated Studies and Research on Building Engineering (CNERIB) New City El Mokrani, Souidania, Algiers 16097, ALGERIA

<sup>2</sup>University of USTHB, Faculty of civil engineering, BP 32 Bab Ezzouar, 16111, ALGERIA.

[\\*hassina.geniecivil@gmail.com](mailto:hassina.geniecivil@gmail.com)

**Abstract** – The use of transverse stiffening ribs to reinforce thin-walled I-section steel beams represents an effective strategy for improving structural stability while optimizing material efficiency. Despite their potential advantages, current research still lacks comprehensive design guidelines and reliable predictive approaches to address the buckling behavior and instability mechanisms associated with these stiffened members. To bridge this gap, a detailed numerical investigation was carried out to evaluate the buckling response of I-section beams reinforced with transverse stiffeners (TSB), with conventional unstiffened beams considered as reference cases. Two finite element formulations were developed and implemented: one based on the Euler–Bernoulli beam theory and the other on the Timoshenko beam theory, allowing the influence of transverse shear deformation to be explicitly assessed. A comprehensive parametric study was performed to examine the effects of stiffener location, width, and spacing on the global buckling behavior of the beams. The numerical results indicate that all investigated configurations satisfy the required buckling resistance for structural design. Beams reinforced with transverse stiffeners consistently exhibited superior buckling performance compared to traditional beams. Furthermore, the buckling strength increased with larger stiffener widths and reduced stiffener spacing. These findings provide valuable insights and a sound theoretical basis for the practical application and optimized design of transverse stiffeners in steel flexural members.

**Keywords** – Thin-walled I-section beams, Transverse stiffeners, Finite element analysis, Euler–Bernoulli beam theory, Timoshenko beam theory

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## Analysis of Conformable Derivatives in Graphene's Dirac-Weyl Dynamics

Merad ASMA<sup>1</sup> and Merad SOUHEIB<sup>2</sup>

<sup>1</sup>Department of Renewable Energies, University of Djilali Bounaama,  
Khemis Miliana, Algeria

<sup>2</sup>Department of Mathematics, Faculty of Sciences, University of  
Algiers 1, Algiers, Algeria.

\*[a.merad@univ-dbk.m.dz](mailto:a.merad@univ-dbk.m.dz)

**Abstract** – This paper presents a comprehensive mathematical analysis of applying conformable fractional derivatives to the Dirac-Weyl equation in graphene. Through explicit analytical derivations, numerical verification, and rigorous testing, we identify valid results, correct prevalent errors, and expose fundamental limitations of the conformable framework. We demonstrate that while certain formal solutions exist, the approach suffers from broken gauge invariance, non-hermiticity, and incompatibility with graphene's physical symmetries.

**Keywords** – Dirac-Weyl equation, graphene, conformable derivative, fractional derivatives

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## Remaining Useful Life and Capacity Prediction Via Machine Learning for Li-Ion Batteries

Ozan KIYIKCI<sup>1</sup>

<sup>1</sup>Physics Department, Faculty of Science, Atatürk University, Türkiye, <https://orcid.org/0000-0002-9024-8194>

\*[ozan.kiyikci@atauni.edu.tr](mailto:ozan.kiyikci@atauni.edu.tr)

**Abstract** – I present a practical study on predicting (i) remaining useful life (RUL) in cycles and (ii) one-step-ahead capacity for lithium-ion batteries using machine learning, while explicitly targeting a realistic setting in which the available dataset is small. I utilize the publicly accessible NASA PCoE lithium-ion aging dataset[1] (cells labeled B0005–B0027) to construct a cycle level summary table suitable for learning tasks at the cycle time scale. For RUL prediction, I use an LSTM regressor, which is a sequence learning model that exploits the temporal nature of battery aging[2]. For capacity prediction, I employ a strong non sequential baseline a Random Forest regressor trained on window flattened features[3]. I then derive the state of health (SOH) by normalizing the predicted capacity with the rated capacity [4]. To avoid data leakage and to test generalization, I apply a battery level split, training on six cells and evaluating on an unseen cell (B0027) [5]. The LSTM demonstrates strong generalization performance for RUL prediction on the holdout cell (MAE  $\approx$  1.57 cycles,  $R^2 \approx$  0.94 on the test windows) while the Random Forest provides reliable capacity forecasting (MAE  $\approx$  5.8 mAh,  $R^2 \approx$  0.46). In addition to reporting standard performance metrics, I emphasize engineering decisions that make the study reproducible and trustworthy under limited data conditions, including battery level evaluation, consistent feature scaling, systematic artifact logging (models, metrics, predictions, and plots), and clearly defined baselines. The result is a concise reference implementation that can be extended to multi horizon forecasting and early end of life prediction.

*Keywords* – Lithium-ion battery, remaining useful life, capacity prediction, machine learning, LSTM, Random Forest

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## Radiation Shielding Performance of W-Containing Cocrfeni High-Entropy Alloys: A Machine Learning and EPIXS Study

Sevda Saltik<sup>1</sup>

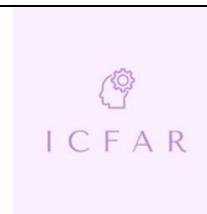
<sup>1</sup>Department of Physics, Atatürk University, Erzurum, Türkiye

\*[sevdasaltik@atauni.edu.tr](mailto:sevdasaltik@atauni.edu.tr)

**Abstract** – High-entropy alloys (HEAs) have recently gained increasing attention for radiation shielding applications due to their unique compositional flexibility, structural stability, and tunable electron density. Among them,  $(\text{CoCrFeNi})_{100-x}\text{W}_x$  alloys constitute a promising system where W addition is expected to substantially modify photon–matter interaction behavior through its high atomic number and strong scattering cross-section. In this study, the mass attenuation coefficients (MAC) of five HEA compositions (W0, W5, W10, W15, W20) were predicted using a machine learning (ML) regression model and systematically compared with theoretical values calculated using the EPIXS database. Based on these MAC values, key radiation attenuation parameters including linear attenuation coefficient (LAC), half-value layer (HVL), mean free path (MFP), and effective atomic number ( $Z_{\text{eff}}$ ) were evaluated over a broad photon energy range. The ML-predicted MAC values showed very good agreement with EPIXS data, demonstrating that the model successfully captures the nonlinear energy-dependent attenuation behavior of multicomponent HEAs. Results show that increasing W content leads to a notable enhancement in MAC and  $Z_{\text{eff}}$ , especially in the low-energy region dominated by the photoelectric effect. Consequently, alloys with higher W concentrations demonstrated reduced HVL and MFP values, indicating superior attenuation performance. These findings highlight the strong influence of W addition on the radiological response of CoCrFeNi-based HEAs and emphasize the potential of ML-assisted prediction frameworks for accelerating the screening and design of next-generation lightweight shielding materials.

*Keywords* – Radiation shielding, Tungsten-addition, high-entropy alloys, machine learning, photon attenuation

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## Nouvelles Benzimidazo[1,2-C]Quinazolines Et Indolo[2,3-B]Quinoxalines : Analyse Structurale, Propriétés Antibactériennes

Houda LAMSSANE<sup>1</sup>, Yousra SEQQAT<sup>2</sup>, Omar ABDELLAOUI<sup>3</sup>, Mohamed SATTEIH<sup>4</sup>, Amal  
HAOUDI<sup>5</sup>, Ahmed MAZZAH<sup>6</sup>, Youssef KANDRI RODI<sup>7</sup> and Khadija MOUGHAMIR<sup>8</sup>

<sup>1</sup>Laboratory Of Applied Organic Chemistry, Sidi Mohamed Ben Abdellah University, Faculty Of Science And  
Technology, Road Immouzer, BP 2202 Fez, Morocco;

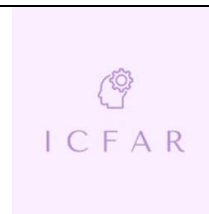
<sup>2</sup>Science and Technology of Lille USR 3290, Villeneuve d'ascq cedex France

\*[houda.lamssane@usmba.ac.ma](mailto:houda.lamssane@usmba.ac.ma)

**Abstract** – Nitrogen heterocycles are indispensable scaffolds in medicinal chemistry, forming the core of numerous approved therapeutic agents due to their unique capacity to engage effectively with diverse biological targets [1]. Specifically, the benzimidazo[1,2-c]quinazoline and indolo[2,3-b]quinoxaline nuclei have garnered significant attention, exhibiting a wide array of promising bioactive properties, including cytotoxic, antiviral, and, crucially, antimicrobial activities [2, 3]. In response to the critical challenge of antimicrobial resistance, our work focused on the rational synthesis and comprehensive biological evaluation of novel derivatives of these key heterocycles.

This presentation details the efficient synthetic strategy employed to access these new derivatives. Their chemical identities and purities were rigorously confirmed through standard spectroscopic methods (NMR, LC-MS) and definitively validated by single-crystal X-ray diffraction.

**Keywords** –Nitrogen Heterocycles, Benzimidazo[1,2-c]quinazolines, Indolo[2,3-b]quinoxalines, Antibacterial Activity, X-ray Diffraction



## Advances in Chemistry Studies: From Fundamental Research to Practical Applications

Mouna BENBOUDA<sup>1</sup>

<sup>1</sup>process engineering department, setif\_1 Ferhat Abbas University, Algeria

[\\*benbouda.mouna@gmail.com](mailto:benbouda.mouna@gmail.com)

**Abstract** – Chemistry continues to be at the forefront of scientific innovation, bridging fundamental research and real-world applications. This seminar will provide an overview of recent advances in chemical sciences, including developments in organic synthesis, materials chemistry, and analytical techniques. Emphasis will be placed on green chemistry approaches, sustainable methodologies, and novel catalytic systems that enhance reaction efficiency and selectivity. Additionally, the seminar will explore interdisciplinary applications of chemistry in energy storage, environmental remediation, and biomedical technologies. Attendees will gain insight into current trends, challenges, and future directions in chemistry research, highlighting the transformative impact of chemical innovations on society.

**Keywords** – Chemistry, Organic Synthesis, Materials Chemistry, Analytical Techniques, Green Chemistry

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## Emerging Trends in Modern Chemistry: Innovations and Applications

Mouna BENBOUDA<sup>1</sup>

<sup>1</sup>*process engineering department, setif\_1 Ferhat Abbas University, Algeria*

[\\*benbouda.mouna@gmail.com](mailto:benbouda.mouna@gmail.com)

**Abstract** – Modern chemistry is evolving rapidly, offering innovative solutions to global challenges in health, environment, and industry. This seminar will highlight recent breakthroughs in chemical research, focusing on the design of advanced materials, sustainable synthetic strategies, and novel analytical methods. Particular attention will be given to the development of eco-friendly chemical processes, catalysts, and functional nanomaterials that improve efficiency and reduce environmental impact. Case studies illustrating the application of chemistry in renewable energy, pollutant removal, and drug delivery will also be discussed. The seminar aims to provide participants with a comprehensive understanding of how contemporary chemical research is shaping future technologies and fostering interdisciplinary collaborations. Attendees will gain insights into cutting-edge methodologies and emerging trends in chemistry that have significant societal and technological implications.

*Keywords* – Modern Chemistry, Sustainable Chemistry, Advanced Materials, Catalysis, Nanomaterials

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## Investigation of the Cellular Uptake Mechanisms of Mesoporous Silica Drug Delivery Systems and Their Effects on Reactive Oxygen Species in Mouse Monocyte–Macrophage Cells

Elif SU PEKTAŞ<sup>1</sup>, Mukaddes CAN<sup>2</sup> ve Pembegül UYAR ARPACI<sup>3</sup>

<sup>1</sup>*Biyoteknoloji/ Fen bilimleri Enstitüsü, Selçuk Üniversitesi, Türkiye*

<sup>2</sup>*Kimya Mühendisliği/ Mühendislik ve Doğa Bilimleri Fakültesi, Konya Teknik Üniversitesi, Türkiye*

<sup>3</sup>*Biyoteknoloji/ Fen Fakültesi, Selçuk Üniversitesi, Türkiye*

[\\*eulku284@gmail.com](mailto:eulku284@gmail.com)

[\\*mcan@ktun.edu.tr](mailto:mcan@ktun.edu.tr)

[\\*pembegul@selcuk.edu.tr](mailto:pembegul@selcuk.edu.tr)

**Abstract** – The immune system is a complex defense network that protects the body against various pathogens and harmful molecules. Macrophages, one of the key components of this system, perform critical functions such as phagocytosis, antigen presentation, cytokine secretion, and regulation of inflammation, thereby ensuring the effective operation of both innate and adaptive immune responses. Found in many tissues throughout the body, macrophages play a central role in post-infection tissue repair and the overall modulation of immune activity.

Mesoporous silica structures stand out as biocompatible materials suitable for transporting biological molecules such as drugs, antigens, and proteins due to their ordered pore architectures ranging between 2–50 nm. The ability to modify their surfaces with functional groups significantly influences their recognition, interaction, and uptake by macrophages. Owing to their controlled release properties, mesoporous silica materials contribute to the more effective use of therapeutic agents, particularly in cancer treatments and chronic inflammatory diseases. Among these structures, SBA-15 is frequently preferred as a drug and antigen carrier due to its high surface area and well-defined pore organization.

In this study, SBA-15 derivatives with different surface modifications (S0, S4, S5, S6) were evaluated in RAW 264.7 macrophage cells. BET, FTIR, TEM, and XRD analyses demonstrated that all structures preserved their characteristic mesoporous silica organization. According to XTT cytotoxicity results, S0 and S5 exhibited the highest biocompatibility with IC<sub>50</sub> values above 500 µg/mL, S6 showed moderate toxicity with an IC<sub>50</sub> of approximately 350–400 µg/mL, while S4 displayed the highest toxicity with an IC<sub>50</sub> of 336 µg/mL. These findings reveal that surface modifications significantly influence macrophage biocompatibility and cellular responses.

**Keywords** – SBA-15, macrophage, IC<sub>50</sub>, XTT, cytotoxicity, mesoporous silica

## Nonlinear Numerical Modeling of Laterally Loaded Piles Embedded in Saturated Clays

Y. BAKHTAOUI<sup>1</sup> and H. ZIOU<sup>2</sup>

<sup>1</sup>National Center for Studies and Integrated Research on Building (CNERIB), Algeria

\* [yac\\_bak@gmail.com](mailto:yac_bak@gmail.com)

**Abstract** – Nowadays, piles are increasingly used as foundation systems for industrial and offshore structures. However, their reliability may be questioned when subjected to horizontal loads, whether monotonic or cyclic in nature. In practice, many existing national design codes for deep foundations under lateral loading mainly address static conditions and often assume a linear elastic behavior of the surrounding soil. Such assumptions may lead to inaccurate predictions, particularly when dealing with saturated clayey soils, which exhibit pronounced nonlinear behavior under lateral loading.

This study proposes a numerical modeling approach for piles embedded in saturated clays and subjected to horizontal actions. The problem is formulated using a simplified finite element model combined with a hyperbolic constitutive relationship to represent the nonlinear soil response. An iterative solution procedure is implemented to account for the nonlinearity of the soil–pile interaction.

The proposed method is validated against available experimental data and further assessed through a series of parametric studies, allowing the influence of key soil and pile parameters to be examined. The results demonstrate a good agreement with experimental observations and highlight the limitations of conventional linear approaches. Overall, the proposed modeling strategy provides a more realistic and accurate representation of pile behavior under lateral loading in saturated clays, while maintaining a reasonable level of computational efficiency.

*Keywords* – Pile foundations, Numerical modeling, Nonlinear soil behavior, Hyperbolic relations, Saturated clays, Lateral loading, Finite element method

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## Aort Geometrisi Üzerinde Çoklu Yaş Grubu Viskozite Modellemesi ve HAD Analizi

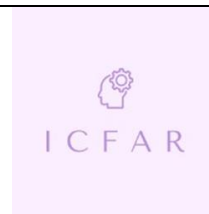
Ahmet ÇOKYİĞİT<sup>1</sup>, Arif ÇUTAY<sup>2</sup> ve Özdeş ÇERMİK<sup>3</sup>

<sup>1</sup>Makine Mühendisliği / Fen Bilimleri Enstitüsü, Kahramanmaraş Sütçü İmam Üniversitesi, Türkiye

[\\*cokyigit046@gmail.com](mailto:cokyigit046@gmail.com)

**Özet** – Bu tez çalışmasında, farklı yaş gruplarındaki bireylerin aort damarlarında meydana gelen hemodinamik değişimleri, kanın viskozitesine bağlı olarak incelemeyi amaçlamakta ve bu bağlamda Hesaplamalı Akışkanlar Dinamiği (CFD) ile kapsamlı bir sayısal analiz gerçekleştirilmektedir. Yaşla birlikte değişen biyofiziksel parametreler (özellikle kan viskozitesi, damar duvarlarının elastikiyeti ve aort geometrisinde gözlemlenen yapısal değişiklikler) dikkate alınarak oluşturulan modeller aracılığıyla, farklı yaş gruplarına özgü hemodinamik davranışlar ayrıntılı olarak değerlendirilmiştir. Simülasyonlar sonucunda elde edilen veriler kapsamında, aort içindeki akışın hız dağılımı gibi kritik parametreler karşılaştırmalı olarak analiz edilmiştir. Bu analizler, özellikle yaşın ilerlemesiyle birlikte kanın viskozitesinde meydana gelen artışın akış dinamiği üzerinde nasıl etkiler yarattığını ortaya koymayı hedeflemektedir. Elde edilen bulgular, kardiyovasküler sistemde yaşa bağlı olarak gelişebilecek hastalık risklerinin daha iyi anlaşılması açısından önemli ipuçları sunmakta ve kişiye özel hemodinamik modellemelerin, gelecekteki tanı ve tedavi planlamalarında nasıl bir rol üstlenebileceğine dair öngörüler sağlamaktadır.

**Anahtar Kelimeler** – Farklı Yaş Gruplarına Göre Viskozite Değerleri, Farklı Aort Geometrilerinde Kan Akışı, CFD ve FSI simülasyonu



## Molecular Docking Insights for Enhanced Drug Delivery: A Flavonoid Inclusion Complex

Boulahraf DHOUHA<sup>1</sup>

<sup>1</sup>Laboratory of Organic Chemistry and interdisciplinary, Mohamed Cherif Messaadia University., Souk Ahras, 41000, Algeria.

[\\*d.boulahraf@univ-soukahras.dz](mailto:d.boulahraf@univ-soukahras.dz)

**Abstract** – Flavonoids are bioactive molecules with significant therapeutic potential, but their poor solubility limits effective application. This study investigates the inclusion of 3,5,7-Trihydroxyflavone into a cyclic oligosaccharide cavity using molecular docking to evaluate its potential in drug-delivery systems. A total of 1000 docking runs were performed with AutoDock 4, employing the Lamarckian Genetic Algorithm to explore binding orientations. Analysis revealed that the hydrophobic portion of the flavonoid penetrates the cavity, while the hydrophilic hydroxyl groups form stabilizing hydrogen bonds at the entrance. Cluster analysis highlighted dominant low-energy conformations, confirming the stability of the host–guest complex. These findings provide structural insights that can guide future studies aimed at improving the solubility, stability, and antioxidant activity of flavonoids in pharmaceutical applications.

*Keywords* – inclusion complexes, molecular docking, drug delivery and flavonoids.

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## Parola Güvenliđi için Kullanılan Hash Algoritmalarının Karşılaştırmalı Analizi

Zeynep GÜL ASLAN<sup>1</sup> ve Serdar SOLAK<sup>2</sup>

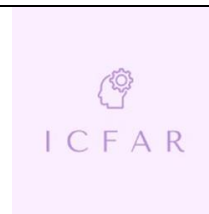
<sup>1</sup>Bilişim Sistemleri Mühendisliđi ABD/ Fen Bilimleri Enstitüsü, Kocaeli Üniversitesi, Türkiye

<sup>2</sup>Bilişim Sistemleri Mühendisliđi / Teknoloji Fakültesi, Kocaeli Üniversitesi, Türkiye

[\\*245172013@kocaeli.edu.tr](mailto:*245172013@kocaeli.edu.tr)

**Özet** – Veri tabanı sistemlerinde kullanıcı parolalarının güvenli biçimde saklanması, güncel siber tehditlerin artmasıyla birlikte her zamankinden daha önemli hale gelmiştir. Son yıllarda yaşanan veri sızıntıları, parolaların düz metin olarak tutulmasının ya da zayıf koruma yöntemlerinin ciddi güvenlik sorunlarına yol açtığını açık biçimde göstermektedir. Bu nedenle, kullanılan hash algoritmalarının niteliđi ve uygulanan ek güvenlik önlemleri, parola güvenliđini doğrudan belirleyen temel faktörlerdir. Bu çalışmada, veri tabanlarında parolaları korumak için kullanılan güncel yöntemler bir arada ele alınmış; özellikle salt ve pepper kullanımının sağladığı katkılar değerlendirilmiştir. Ayrıca MD5 ve SHA-1 gibi artık güvenli kabul edilmeyen algoritmalar ile bcrypt, scrypt, PBKDF2 ve Argon2 gibi modern ve daha dirençli çözümler mimari yapıları, bilinen saldırı türlerine karşı dayanıklılıkları ve performansları açısından karşılaştırılmıştır. Bu karşılaştırma, zayıf algoritmaların neden risk oluşturduđunu ve modern yaklaşımların hangi sorunlara çözüm getirdiđini daha net ortaya koymaktadır. Çalışmanın amacı, güvenli parola saklama konusunda hem teknik hem de uygulamaya yönelik bir farkındalık oluşturmak ve geliştiricilere daha sağlam güvenlik tasarımları yapabilmeleri için yol göstermektir.

**Anahtar Kelimeler** – Parola Güvenliđi, Hash Algoritmaları, Kriptografi, Veri Tabanı Güvenliđi, Kriptografik Hash Algoritmaları



## Response Surface Methodology Optimization of Dye Decomposition Over a Novel Heterogeneous Catalyst

Asma BELLAOUAR<sup>1</sup>, Nacira BELLAOUAR<sup>2</sup>, Fares FENNICHE<sup>3</sup>, Abdennour SERRADJ<sup>4</sup>, Roumaissa MAHDJOUBI<sup>5</sup> and Rebha BELLAOUAR<sup>6</sup>

<sup>1</sup>Laboratory Interactions Materials-Environment (LIME), University of Jijel, 18000 Jijel, Algeria.

<sup>2</sup>Biogeochemistry Laboratory of Desertic Environment, KasdiMerbah Ouargla University, Ouargla 30000, Algeria.

<sup>3</sup>Materials, Energy Systems Technology and Environment Laboratory, Faculty of Sciences and Technology, University of Ghardaia, 47000, Ghardaia, Algeria

<sup>4</sup>Laboratoire Croissance et Caractérisation de Nouveaux Semi-conducteurs, Université Ferhat Abbas, Sétif-1, Sétif 19000, Algérie.

<sup>5</sup>Faculty of Sciences and Technology, University of Ghardaia, 47000, Ghardaia, Algeria

[\\*amiraphysique2@gmail.com](mailto:*amiraphysique2@gmail.com)

**Abstract** – The degradation of methyl orange (MO) was investigated using iron-modified dolomite prepared through a simple impregnation method followed by calcination. The natural and modified dolomite samples were characterized by XRD, FTIR, XRF, and EDX analyses. The results confirmed the preservation of the dolomite crystalline structure and the successful incorporation of iron into its matrix. The thermodynamic study revealed that the degradation reaction is endothermic and associated with a decrease in system disorder. Kinetic analysis indicated that the process is controlled by a surface reaction. To optimize the degradation efficiency, a statistical design of experiments (DoE) based on the Central Composite Design (CCD) methodology was applied. The optimal conditions were determined at an initial dye concentration of 40 mg/L, a catalyst dosage of 0.93 g/L, and an H<sub>2</sub>O<sub>2</sub> concentration of 7.26 mM. This study highlights the effectiveness of the DoE approach in optimizing operational parameters and improving the catalytic performance of iron-modified dolomite in wastewater treatment.

**Keywords** – DoE, iron-modified dolomite, Fenton process, optimization, wastewater treatment



## Manyezit ve Genleştirilmiş Perlit Kullanılarak Üretilen Bims Blokların Performans İncelemesi

Orhan İLBOĞA<sup>1</sup>, Servet YILDIZ<sup>2</sup> ve Alper TUNGA ÖZGÜLER<sup>3</sup>

<sup>1</sup>İnşaat Mühendisliği Teknolojileri / Fen Bilimleri Enstitüsü, Fırat Üniversitesi, Türkiye

<sup>2</sup>İnşaat Mühendisliği / Teknoloji Fakültesi, Fırat Üniversitesi, Türkiye

<sup>3</sup>İnşaat Bölümü / Malatya OSB Meslek Yüksekokulu, İnönü Üniversitesi, Türkiye

[\\*o.ilboga\\_44@hotmail.com](mailto:*o.ilboga_44@hotmail.com)

**Özet** – Türkiye, perlit ve manyezit rezervleri bakımından dünyada önemli bir konuma sahiptir. Özellikle geliştirilmiş perlit, düşük yoğunluk, boşluklu yapısı ve iyi ısı yalıtım özellikleri sayesinde hafif yapı malzemeleri ve yalıtım uygulamalarında yaygın olarak tercih edilmektedir. Yerli perlit kaynaklarının değerlendirilmesi, yapı sektöründe hem ekonomik hem de çevresel açıdan önemli avantajlar sunmaktadır. Manyezit ise yüksek saflıkta ve kaliteli rezervleriyle refrakter malzeme üretimi, çelik üretimi ve bağlayıcı sistemler olmak üzere birçok endüstride kritik bir hammadde olarak kullanıldığı görülmektedir. Bu minerallerin ülkemizde bol miktarda bulunması, bims blok üretiminde katkı malzemeleri olarak kullanılmasını sürdürülebilirlik ve ekonomiklik açısından cazip hale getirmektedir. Bu çalışmada, pomza agregası kullanılarak üretilen bims bloklar referans alınmış olup; hacimce %26, %32 ve %38 oranlarında geliştirilmiş perlit ile %1 oranında manyezit ikamesi yapılarak yeni bims blok karışımları elde edilmiştir. Toplamda dört farklı karışım oranına sahip bims blok numuneleri üretilmiş ve numuneler üç gün süreyle buhar kürüne ve ardından dört gün süreyle de doğal hava şartlarına tabi tutulmuştur. Kür işlemi sonrasında üretilen bims blokların taze ve kuru birim hacim ağırlıkları, su emme oranları ve bazı mekanik özellikleri deneysel yöntemlerle belirlenmiştir. Elde edilen bulgulara göre, geliştirilmiş perlit oranının artmasıyla birlikte bims blokların kuru birim hacim ağırlıklarında belirli farklılıklar olduğu, buna karşılık basınç dayanımında ise genel olarak artış eğilimi gözlemlendiği tespit edilmiştir. Elde edilen sonuçlar, geliştirilmiş perlit ve manyezit katkılı bims blokların yapı malzemesi olarak kullanılabilirliğini ortaya koymaktadır.

*Anahtar Kelimeler – Perlit, Manyezit, Bims Blok, Su Emme, Basınç Dayanımı*



## Invariant Formalism for the Paraquantum Generalized Harmonic Oscillator

M. HARRAT<sup>1</sup> and S. ALLAMA<sup>2</sup>

<sup>1</sup>Laboratoire de Physique Mathématique et Subatomique (LPMPS)

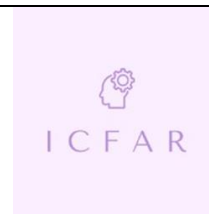
<sup>2</sup>Physics Department, Fundamental Sciences Faculty Mentouri University, Constantine 1, 25000, Algeria

[\\*harrat.mounia@umc.edu.dz](mailto:harrat.mounia@umc.edu.dz)

**Abstract** – The quantum mechanical treatment of the harmonic oscillator is foundational, serving as a critical solvable model for numerous physical phenomena, including molecular vibrations, the quantization of the electromagnetic field (photons), and the specific heat of solids (phonons). Its significance lies in providing exact solutions for the time-independent Schrödinger equation, yielding quantized energy levels  $E_n = \hbar\omega \left( n + \frac{1}{2} \right)$ , characterized by the discrete quantum number  $n$ . Beyond the stationary state, the time-dependent Schrödinger equation for the harmonic oscillator Hamiltonian,  $H(t)$ , is of substantial interest, particularly when external forces or time-varying parameters are involved. The invariant method, often employing a time-dependent linear or quadratic invariant operator  $I(t)$  such that  $\frac{dI}{dt} = \frac{\partial I}{\partial t} + \frac{1}{i\hbar} [I, H(t)] = 0$ , offers a powerful technique for finding exact solutions, specifically the time evolution of the system's wave function and expectation values. In this research, we extend this framework to a paraquantum system described by a generalized Hamiltonian. This generalization necessitates the introduction of a paraquantum momentum operator and a unitary parameter, modifying the canonical commutation relations and the structure of the phase space, thereby exploring novel aspects of quantum dynamics beyond the standard canonical quantization paradigm.

*Keywords* – harmonic oscillator, Schrödinger equation, paraquantum system, invariant method, unitary parameter

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## Fuel Quality Monitoring

Harche RIMA<sup>1</sup> and Laoufi NADIA AICHA<sup>2</sup>

<sup>1</sup>Laboratory of the Transfert Phenomena (LPDT), Department of chemical engineering and  
Cryogenics, FGMGP. USTHB

[\\*s\\_r\\_harche@yahoo.fr](mailto:s_r_harche@yahoo.fr)

**Abstract** –In this work we carried out laboratory analyzes of the RA1K refinery of Skikda of three fuels: unleaded gasoline, kerosene and diesel. In a second part we obtained, using the QSPR technique, three mathematical relationships of the boiling temperature, the density and the enthalpy of vaporization of linear, branched and cycloalkanes as a function of the number of carbon, number of hydrogen, the Wiener index, the partition coefficient and the molar refractive index. The model retained is that with four molecular descriptors and a topological index having acceptable coefficients of  $R_m$ ,  $R^2$ ,  $Raj^2$ , SD and F.

**Keywords** – Fuels, ASTM, QSPR, hydrocarbon, multiple linear regression (MLR)

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## Fiber Lazer Makinalarında Düşük Hızlarda Nozul Tipinin Kesim Yüzeyine Etkisi

Mustafa AKÇİL<sup>1</sup> ve Mehmet ALİ KARACA<sup>2</sup>

<sup>1</sup>Metaller ve Malzeme Mühendisliği, Sakarya Uygulamalı Bilimler Üniversitesi, Türkiye

<sup>2</sup>İmalat Mühendisliği, Sakarya Uygulamalı Bilimler Üniversitesi, Türkiye

[\\*22500605029@subu.edu.tr](mailto:*22500605029@subu.edu.tr)

**Özet** – Teknolojinin hızlı bir şekilde gelişmesi, imalat süreçlerinde hız, maliyet ve kaliteye yönelik beklentilerin artmasına neden olmaktadır. Özellikle karmaşık geometrilere sahip ürünlerin kolaylıkla işlenebilmesi ve yüksek hassasiyet gerektiren işlemlerde ilk tercih edilen imalat tekniği lazer kesim tezgâhlarıdır. Modern lazer kesme teknolojisini geleneksel yöntemlere kıyasla daha avantajlı hâle getirmektedir. Geleneksel yöntemlerde görülen mekanik kesme yükleri, titreşim, gereksiz ısı girişi ve ek yüzey işçiliği ihtiyacı, lazer kesim teknolojisinin sağladığı hız ve verimlilik ile büyük ölçüde ortadan kalkmıştır. Bu sistemler bilgisayar kontrollü olarak çalışsa da işlem parametrelerinin optimize edilmesi süreci hâlâ büyük ölçüde operatör deneyimine bağlıdır. Bu çalışmada, kapsamlı bir literatür taraması doğrultusunda operatörlerin belirli bir malzeme kalınlığında hangi parametreleri değiştirmesi gerektiği incelenmiş ve endüstride yaygın olarak kullanılan 20 mm kalınlığındaki S235JR çeliğin, 6 kW gücündeki fiber lazer ile kesiminde farklı nozul tiplerinin yüzey kalitesi ve kesim performansı üzerindeki etkileri araştırılmıştır. Deneysel çalışmada kesme hızı, lazer gücü, odak mesafesi, gaz türü, frekans ve darbe genişliği sabit tutulmuş; yalnızca nozul tipi ve çapı değiştirilmiştir. Bu kapsamda 1,5 mm çift katmanlı nozul, 1,5 mm tek katmanlı nozul ve 2,5 mm çift katmanlı nozul kullanılarak yapılan kesimler karşılaştırılmıştır. Elde edilen sonuçlar, nozul tasarımının kesim kenar kalitesi, cüruf oluşumu ve işlem verimliliği üzerinde belirleyici bir rol oynadığını göstermekte olup, endüstriyel uygulamalar için optimum nozul seçimine yönelik önemli bulgular sunmaktadır. Özellikle orta ve kalın sac kesimlerinde nozul seçiminin rastgele değil, kesme hızı, nozul tipi, lazer gücü, odak mesafesi, gaz parametreleri ve malzeme kalınlığına özel olarak optimize edilmesi gereklidir.

*Anahtar Kelimeler – Lazer kesme, Yüzey kalitesi, Nozul tipi, Gaz akışı, Düşük hız*

## Comparative Analysis of PID And Artificial Neural Network-Based Controllers for Attitude Determination and Control in Spacecraft

Aslı DURMUŞOĞLU<sup>1</sup>

<sup>1</sup>Mechanical Engineering Department/Engineering Faculty, Hakkari University, Turkey

[\\*aslidurmusoglu@hakkari.edu.tr](mailto:aslidurmusoglu@hakkari.edu.tr)

**Abstract** – Spacecraft's attitude determination and control systems (ADCS) need high-performance controllers since they need to be able to move very precisely and because the actuators don't have a lot of power. This research examines the attitude control problem of a rigid spacecraft, comparing the numerical performance metrics of a traditional Proportional-Integral-Derivative (PID) controller with those of an Artificial Neural Network (ANN)-based intelligent controller. We used Euler angles and angular velocities to make the spacecraft's dynamic model, and we used a rigid body dynamics approach to simulate moments of inertia. The PID controller is set up to work with reference moves, while the ANN-based controller is taught to learn how the system behaves in a nonlinear way. The simulation findings show that when using a PID controller, the settling time for the orientation error is about 8–10 seconds. However, when utilizing an ANN-based controller, this time is cut down to 4–5 seconds. The greatest overshoot with a PID controller is about 12–15%, however with an ANN-based controller, this number has dropped to less than 5%. Also, adopting an ANN-based controller cut steady-state inaccuracy by about 40–50%. When looking at the control torque needs, it was found that the PID controller needed greater instantaneous torque, while the ANN-based controller made a smoother and more energy-efficient control signal. The results clearly reveal that the PID controller is better since it is easier to use and works in more situations. The ANN-based controller, on the other hand, works better when there are nonlinearities and parameter uncertainties.

*Keywords* – Artificial neural networks, Spacecraft, Attitude determination and control, PID controller, Rigid body dynamics

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## Assessment of the Impact of Climate Change on the Competitiveness of Agricultural and Agro-Industrial Products in Global Markets

Urgenishbayev ANUARBEK<sup>1</sup>

<sup>1</sup>Department of Economics and Management, Faculty of economics and law, K.Zhubanov Aktobe regional university, the Republic of Kazakhstan (ORCID: <https://orcid.org/0009-0009-0259-6278>)

\*[y\\_anuar@mail.ru](mailto:y_anuar@mail.ru)

**Abstract** – The study is devoted to the impact of climate change on the competitiveness of agro-industrial products on world markets. The climatic factors affecting the production, cost and export of products are analyzed. Methods of climate modeling, econometric analysis and expert assessments are used. It is expected to identify vulnerable industries, forecast changes in the export structure and develop recommendations for adapting agriculture to climate risks to increase sustainability and competitiveness. Climate change poses significant challenges to agricultural competitiveness by altering productivity, resource availability, and global trade dynamics. This study examines how climate change affects agricultural competitiveness at global, regional, and enterprise levels, with emphasis on disparities between developed and developing economies. Drawing on comparative advantage theory, competitiveness theory, and climate adaptation frameworks, the study integrates climatic, economic, and institutional dimensions into a unified analytical model. Using a mixed-methods approach, the research combines quantitative analysis of secondary climate, production, and trade data with qualitative policy review. The anticipated findings suggest that climate change will exacerbate existing inequalities in agricultural competitiveness, particularly in climate-sensitive regions. However, adaptation strategies, institutional support, and innovation can enhance resilience and sustain competitive advantage. The study contributes to theory and policy by linking climate change impacts with agricultural competitiveness and informing climate-smart agricultural strategies.

**Keywords** – climate change, competitiveness, global market, agriculture, globalization, trade barriers, food security, transnational corporations, climate change, sustainable development

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## Farklı Bifurkasyon Açıklarına Sahip Dallanmalı Damar Yapılarında Kan Viskozitesinin Akış Dinamiğine Etkisi

Arif ÇUTAY<sup>1</sup>, Hakan BAYRAKCI<sup>2</sup>, Özdeş ÇERMİK<sup>3</sup> ve Muharrem İMAL<sup>4</sup>

<sup>1</sup>Makine Mühendisliği, Kahramanmaraş Sütçü İmam Üniversitesi, Türkiye

[\\*arif.cutay@gmail.com](mailto:*arif.cutay@gmail.com)

**Özet** –Dallanmalı damar yapılarındaki kan akışının hemodinamik özellikleri, ateroskleroz gelişimi ve damar duvarı hasarının anlaşılması açısından büyük önem taşımaktadır. Bu çalışmada, karotis arter bifurkasyon geometrisinde farklı bifurkasyon açıları ve Carreau modeli ile tanımlanan farklı fizyolojik kan viskozite koşullarının hemodinamik parametreler üzerindeki etkileri hesaplamalı akışkanlar dinamiği (HAD) yöntemi kullanılarak incelenmiştir. Çalışmada kullanılan üç boyutlu dallanmalı damar geometrisi, literatürde yaygın olarak kullanılan deneysel ve anatomik ölçümlere dayalı olarak oluşturulmuş; sayısal analizlerin doğruluğu çözüm açısından bağımsızlık çalışmaları ile sağlanmıştır. Giriş sınır koşulu olarak literatürden elde edilen zamana bağlı hız profili kullanılmış, kanın Newtonyen olmayan davranışı Carreau viskozite modeli ile temsil edilmiştir. Farklı bifurkasyon açıları ve farklı viskozite koşulları için gerçekleştirilen transiyent analizler sonucunda hız profilleri, duvar kayma gerilmesi (WSS), basınç dağılımı, akım çizgileri ve çıkış debi oranları ayrıntılı olarak değerlendirilmiştir. Elde edilen bulgular, bifurkasyon açısının artmasıyla birlikte özellikle iç karotis arter başlangıcında düşük duvar kayma gerilmesi bölgelerinin genişlediğini, farklı fizyolojik viskozite koşullarının ise hız alanı ve WSS dağılımı üzerinde belirgin değişimlere yol açtığını göstermiştir. Bu çalışma, karotis bifurkasyon hemodinamiğinde geometrik parametreler ile kan reolojisinin birleşik etkilerini karşılaştırmalı olarak ortaya koyarak literatüre katkı sağlamayı amaçlamaktadır.

**Anahtar Kelimeler** –Hesaplamalı Akışkanlar Dinamiği, Karotis Arter, Bifurkasyon Açısı, Carreau Viskozite Modeli, Kan Reolojisi, Duvar Kayma Gerilmesi



## Stability of Some Essential Some Essential Spectra of the Sum of Two Blocks of Operators Matrices Via Relatively Fredholm Perturbations

Sana BOUZIDI<sup>1</sup>

<sup>1</sup>*Department of Mathematics/ Faculty of sciences of Sfax, University of Sfax, Tunisia*

[\\*sana.bouzidi2017@gmail.com](mailto:sana.bouzidi2017@gmail.com)

**Abstract** – In this presentation, we deal with the theory of relatively Fredholm perturbations which allows us to provide a new criterion to characterize some essential spectra of the sum of two blocks of operators matrices.

*Keywords* – Include at least 5 keywords or phrases

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## Mapping Research Trends of Fnirs-Based Brain Tumor Studies: A Bibliometric Perspective

Mehmet ÜMIT AK<sup>1</sup>

<sup>1</sup>Department of Software Engineering, Faculty of Engineering and Architecture, Antalya Belek University Antalya, Türkiye

[\\*mehmet.ak@belek.edu.tr](mailto:mehmet.ak@belek.edu.tr)

**Abstract** – Functional near-infrared spectroscopy (fNIRS) has gained increasing attention as a non-invasive optical technique for assessing cerebral hemodynamics and functional alterations associated with brain tumors. Along with related near-infrared optical approaches, such as diffuse optical spectroscopy (DOS) and diffuse optical tomography (DOT), fNIRS has been explored for functional cortical mapping, intraoperative monitoring, and tumor-related hemodynamic assessment. Despite the growing body of literature, the research landscape remains fragmented, and a systematic overview of trends and thematic evolution is still lacking.

This study presents a bibliometric analysis aimed at mapping the scientific structure and research trends of fNIRS-based brain tumor studies. Publications indexed in the Web of Science Core Collection and Scopus databases were retrieved using a structured search strategy combining near-infrared optical techniques with brain tumor-related terms. The findings demonstrate a steady increase in publications over the past two decades, with a marked acceleration in the last ten years. The United States, China, and several European countries emerge as leading contributors with strong international collaboration networks. Keyword evolution analysis reveals a transition from early research focusing on optical property characterization and spectroscopy toward recent themes such as functional brain mapping, multimodal integration, and machine learning-assisted analysis. Co-citation analysis identifies foundational studies on diffuse optical techniques and cerebral hemodynamics as the intellectual core of the field. This bibliometric study provides a structured overview of fNIRS-based brain tumor research and highlights emerging directions that may guide future methodological developments and clinical applications.

*Keywords* – fNIRS, brain tumor, near-infrared spectroscopy, diffuse optical tomography, bibliometric analysis

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## Bash Tabanlı Bütünleşik Bir Otomatik Keşif Pipeline'ı ile Sızma Testlerinde Bilgi Toplama Sürecinin Otomasyonu

Tolga YILDIZ<sup>1</sup>, Nazife GİZEM AVCILAR<sup>2</sup> ve Erhan AKBAL<sup>3</sup>

<sup>1</sup>Adli Bilişim Mühendisliği, Fırat Üniversitesi, Türkiye

<sup>2</sup>Adli Bilişim Mühendisliği, Fırat Üniversitesi, Türkiye

<sup>3</sup>Adli Bilişim Mühendisliği, Fırat Üniversitesi, Türkiye

\*[ngavcilar@firat.edu.tr](mailto:ngavcilar@firat.edu.tr)

**Özet** – Siber güvenlik operasyonlarında ve sızma testlerinde hedef sistem hakkında bilgi toplama süreci, saldırı yüzeyinin doğru şekilde belirlenmesi açısından en kritik aşamalardan biridir. Bu sürecin manuel yöntemlerle yürütülmesi; yüksek zaman maliyeti, insan kaynaklı hata riski ve dağınık veri çıktıları gibi önemli sorunları beraberinde getirmektedir. Bu çalışmada, söz konusu problemlerin giderilmesi ve bilgi toplama sürecinin daha verimli hâle getirilmesi amacıyla Bash tabanlı, modüler ve otomatik bir keşif aracı geliştirilmiştir. Geliştirilen araç; alt alan adı keşfi, aktiflik kontrolü, subdomain takeover (kullanılmayan veya yanlış yapılandırılmış alt alan adlarının üçüncü taraf hizmetler üzerinden ele geçirilmesine dayanan bir web güvenlik zafiyeti) analizi, port taraması ve web arayüzü görselleştirme adımlarını bütünleşik bir pipeline mimarisi altında tek komutla gerçekleştirmektedir. Böylece, farklı güvenlik araçlarının ayrı ayrı çalıştırılmasına gerek kalmadan, uçtan uca otomatik ve tekrarlanabilir bir keşif süreci sunulmaktadır. Aracın performansı, yüksek donanım kapasitesine sahip izole bir Kali Linux sanal ortamında; hackerone.com, vulnweb.com ve nmap.org hedefleri üzerinde test edilmiştir. Elde edilen deneysel sonuçlar, literatürdeki mevcut çalışmalarla karşılaştırmalı olarak analiz edilmiştir. Yapılan değerlendirmeler, geliştirilen aracın tekil zafiyet tarayıcılarına kıyasla saldırı yüzeyini daha geniş bir kapsamda ele aldığını, manuel süreçlere göre analiz süresini dakikalar seviyesine indirdiğini ve merkezi bir HTML raporlama mekanizması sayesinde hatasız ve düzenli çıktı ürettiğini göstermektedir. Sonuç olarak, sunulan otomatik keşif aracı, sızma testi uzmanlarının operasyonel verimliliğini artırarak daha kritik güvenlik zafiyetlerine odaklanmalarına olanak tanımaktadır.

*Anahtar Kelimeler – Bash betiği, keşif, sızma testi, otomasyon, zafiyet analizi*



## Mathematical Modeling and the Historical Evolution of Interdisciplinary Research in the Natural Sciences

Rafik BELGHIT<sup>1</sup>, Mohamed AOUNALLAH<sup>2</sup>, Hicham BELGHIT<sup>3</sup>, Chaima BELGHIT<sup>4</sup>, Salah AOUN<sup>5</sup>,  
Nabti NADJWA<sup>6</sup> and Malki RIMA<sup>7</sup>

<sup>1</sup>Annaba University, ALGERIA

<sup>2</sup>Tebessa University, ALGERIA

[\\*hsilent4@gmail.com](mailto:hsilent4@gmail.com)

**Abstract** – This paper investigates how mathematical modeling has transformed interdisciplinary research at the interface of physics, chemistry, and biology, and how these transformations can be understood through a historical lens. It focuses on key episodes in the development of statistical mechanics, quantum chemistry, and systems biology to show how differential equations, probabilistic models, and numerical simulations have progressively reshaped experimental practice and theoretical interpretation in the natural sciences. Particular attention is given to the mutual feedback between advances in mathematical techniques and the design of physical, chemical, and biological experiments, emphasizing how abstract formalisms guide instrument development and data collection strategies. The study also situates these technical shifts within broader historical changes in academic institutions, research funding, and scientific communication, highlighting turning points where interdisciplinary collaborations moved from marginal initiatives to central drivers of innovation. By combining formal analysis of representative models with historical and conceptual inquiry, the paper argues that the evolution of modeling practices is not merely a sequence of technical improvements but also a cultural and institutional process. This integrated perspective offers a framework for understanding current and future frontiers in academic research, where cross-disciplinary modeling continues to redefine the boundaries between mathematics, the natural sciences, and the humanities.

*Keywords* – *Mathematical modeling, Statistical mechanics, Quantum chemistry, Systems biology, History of science*

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## Efficacy of Drugs in the First, Second and Third-Line Therapy in Patients with Advanced Hepatocellular Carcinoma

Yusra ZARLASHAT<sup>1</sup>, Bushra MUNIR<sup>2</sup>, Wasim ABAS<sup>3</sup> and Abdul GHAFFAR<sup>4</sup>

<sup>1</sup>Department of Biochemistry, Government College University, Faisalabad 38000, Pakistan

<sup>2</sup>Institute of Chemistry, University of Sargodha, Sargodha 40100, Pakistan

<sup>3</sup>National Institute for Biotechnology and Genetic Engineering, Faisalabad, Pakistan

\*[abdulghaffar@gcuf.edu.pk](mailto:abdulghaffar@gcuf.edu.pk)

**Abstract** - Hepatocellular carcinoma (HCC) is the third most prevalent cancer-associated death worldwide, and its occurrence is rapidly increasing. HCC is a fatal health problem in the world however few drugs have existed for clinical treatment. Almost all HCC cases are caused by cirrhosis and many other molecular pathways including the RAS/RAF, PI3K/Akt/mTOR, Wnt/ $\beta$ -catenin, TERT promoter mutation, endothelial growth factor receptor (EGFR), and vascular endothelial growth factor receptor (VEGFR) are thought to take part in HCC carcinogenesis. The weakened immune response, proteins, and oncogenic effect of the hepatitis C virus are directly linked with a significant chance of developing HCC. Direct-acting antivirals (DAAs) fundamentally cure chronic hepatitis C with over 90% cure rates since their recent development. Several established immunotherapy techniques, conventional systemic therapy, and clinical trials lead to significant advancement in novel drug development. The Food and Drug Administration (FDA) approved several drugs between 2017 and 2020 for HCC treatment, including multikinase inhibitors (lenvatinib, regorafenib, ramucirumab, and cabozantinib), immune checkpoint inhibitors (pembrolizumab and nivolumab), and atezolizumab in combination with bevacizumab. Drug research on HCC has now been conducted in more than 1000 active clinical studies for disease control to develop drugs. This review lists the FDA-approved HCC drugs target the molecular pathways for prospective treatment and discuss the upcoming developments such as immunotherapies. Finally, we explore potential issues with pharmacological therapy for HCC, suggest possible solutions for the future, and suggest possible possibilities to develop drugs for HCC treatment.

**Keywords** - Rat sarcoma virus, Rapidly accelerated fibrosarcoma, Telomerase reverse transcriptase, Phosphatidylinositol 3-kinase, Serine-threonine protein kinase, Mammalian target of the rapamycin, Wingless related integration site

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## Influence of High Content of Limestone Dust on the Mechanical Behavior of Quarry Sand Mortars

Salah LABED<sup>1</sup> and Bouzidi MEZGHICHE<sup>2</sup>

<sup>1</sup> Civil and hydraulic engineering / Civil Engineering Research Laboratory, university of mohamed khider biskra, Algeria.

<sup>2</sup> Civil and hydraulic engineering / Civil Engineering Research Laboratory, university of mohamed khider biskra, Algeria.

[\\*salah.labed@univ-biskra.dz](mailto:salah.labed@univ-biskra.dz)

**Abstract** – Crushing stones in limestone quarries to produce crushed sand generates considerable quantities of limestone quarry dust (LQD), these quantities of powder are intended for use as crushed sand in the construction sector or as an addition to building materials.

An experimental study was conducted to find the influence of limestone dust (LD) micro fines (80  $\mu\text{m}$ ) in crushed sand content on the mechanical behavior (compressive and tensile strengths) of cement mortar based on crushed sand (CS).

Crushed sand was partially substituted with limestone dust (LD) in varied percentages ranging from 5% to 35% by mass of crushed sand. The mortar mixes were mixed with a water-to-cement ratio ranging from 0.5 to 0.7 to determine the influence of ratio (W/C) and limestone dust (LD) on cement mortar based on crushed sand (CS).

The results indicate that from 0% to 15% of the fine content in crushed sand could be used without adversely affecting the mechanical properties of all mixes.

In the second part, with a content ranging from 15 to 25%, the results proved that the mechanical behavior of mortar is still acceptable in the ratios of W/C 0.6 and 0.7 However, the mechanical properties of mortar have been affected in the long term.

The mechanical properties of all mixes were strongly affected in the third part, from 25% to 35%, but they could still be used in the ratio of W/C 0.7

*Keywords* – Limestone dust, Micro fines (80  $\mu\text{m}$ ), Crushed sand, Mechanical behavior, Cement mortar, ratio (W/C)

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## Numerical Analysis of Mechanical Behaviour for a Type III Hydrogen Pressure Vessel (15 Mpa) Made of an Aluminum Liner and a Thick Carbon and Jute/Epoxy Composite

Maizia ABDELHAKIM<sup>1</sup>, Habbar GHANIA<sup>2</sup> and Mohammed BETTAYEB<sup>3</sup>

<sup>1</sup>Controls Laboratory Tests, Measurements and Simulations Mechanics, Department of mechanical engineering, Faculty of Technology, Hassiba Benbouali University of Chlef, Algeria.

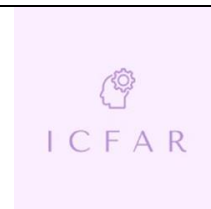
<sup>2</sup>Department of Mechanical Engineering, Faculty of Sciences and Technology, 8 may 1945 University – Guelma, Algeria.

\*[a.maizia@univ-chlef.dz](mailto:a.maizia@univ-chlef.dz)

**Abstract** – The present paper aims to evaluate the mechanical behavior of hydrogen storage vessels type III under internal pressure. The possibility of using bio-composite materials in hydrogen transport and storage structures was studied using two types of fibers (Carbon and Jute). A finite element model has been developed in ANSYS APDL to achieve this goal. This final model enabled the calculation of the analyzed structure's field of stress and strain. A metal liner is coated with a composite material in this type III cylindrical structure. After the confrontation of the results, a comparative study of two different scenarios, which are Aluminum/Carbon-epoxy; Aluminum/Jute-epoxy, has been carried out. The same vessel thickness values have been studied. To estimate the stress distribution in the numerical model, two solid elements were used: the solid 186 with 20 nodes for the vessel's liner and the multilayer solid 186 for the composite part. To predict the maximum variations of stresses, the vessels were loaded with increasing internal pressure. After that, the structure's safety was assessed using Von Mises and Tsai-Wu criteria. The pressure value was 150 bar (15 MPa). Finally, the obtained results illustrate that bio-source fibers can replace synthetic fibers with good reliability in structures based on bio-composite fibers if we manage to determine the adequate percentage of Jute fibers and to optimize the sequence of stacking.

*Keywords* – Finite element, Bio-composite, Jute, Pressure, Vessels Type III

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## Valorization of the Antioxidant and Antimicrobial Activity of the Leaves of *Pistacia Lentiscus* L.

Asmaa BELGHARBI- ALLAM<sup>1</sup>, Nadia CHELLI-CHENTOUF<sup>2</sup>, Mirvette BENYELLES-BENFRÉHA<sup>3</sup>  
and Rym NOURIA BENAMARA<sup>4</sup>

<sup>1</sup>Laboratory of Bioconversion engineering microbiological and safety health, University of Mustapha Stambouli of Mascara; Algeria,

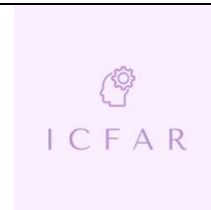
<sup>2</sup>Laboratory of Microbiology Applied to Agribusiness, Biomedical and Environmental (LAMAABE), Faculty of SNV/STU, University of Tlemcen, 13000 Tlemcen, Algeria

\* [asmaabelgharbi@yahoo.fr](mailto:asmaabelgharbi@yahoo.fr)

**Abstract** - This study focuses on the valorization of a fruit shrub called *Pistacia lentiscus* known in the Mascara region under the vernacular name Darwe. It is a useful plant, in folk medicine, to heal the digestive tract and the treatment of arterial hypotension. It is known for its activities: anti-inflammatory, anti-ulcerogenic, analgesic and antioxidant and antimicrobial. Natural plant extracts contain a variety of biologically active molecules. In this context, we attempted to evaluate the antimicrobial and antioxidant activity in vitro of the different extracts (aqueous and methanolic and total oil) prepared from the leaves of *Pistacia lentiscus*. The qualitative analysis of these extracts revealed the presence of free quinones, combined anthraquinones, flavonoids and tannins in different extracts, with, however, the absence of alkaloids, this is confirmed by a quantitative analysis based on dosage, phenolic compounds and tannins including polar extracts which are richest in these molecules, where the phenolic content is (651.80-591.45 µg EAG/mg extract) for the aqueous extract, and (563.17 and 542.93 µg EAG/mg extract) for the methanolic extract and total oil respectively. Evaluation of the antimicrobial activity of the different extracts on all strains tested revealed potent activity of the different extracts, especially the aqueous extract.

**Keywords** - *Pistacia lentiscus*, antioxidant activity, antimicrobial activity

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## Monitoring Vegetation, Building and Water Variations in Tangier-Morocco from 2015 to 2022 Using Very High-Resolution Satellite Images

F-E. EZZAHER<sup>1</sup>, N. Ben ACHHAB<sup>2</sup>, H. NACIRI<sup>3</sup>, N. RAISSOUNI<sup>4</sup> and A. AZYAT<sup>5</sup>

<sup>1</sup>Remote Sensing & Geographic Information System Unit (RS&GIS), Abdelmalek Essaadi University, Tetouan, Morocco

<sup>2</sup>Mathematics and Intelligent Systems (MASI), Abdelmalek Essaadi University, Tangier, Morocco

<sup>3</sup>Remote Sensing, Systems and Telecommunications (TST), Abdelmalek Essaadi University, Tetouan, Morocco

\*[zezzaher@gmail.com](mailto:zezzaher@gmail.com)

**Abstract** – Global change repercussions on land cover and humankind are frighteningly growing over time, necessitating increased efforts to develop solutions to attenuate their effects. The use of remote sensing technologies and its related biophysical indices, such as the Global Environment Monitoring Index (GEMI), Index-based Built-Up Index (IBI), and Modified Normalized Difference Water Index (MNDWI), is turn out to be one of the effective solutions for monitoring these global changes over time, which is considered the first step in every mitigation plan. In this research, we are using those indices to observe changes occurring in land cover classes (i.e., vegetation, building, water) of one of the most important geographical locations, Tangier-Morocco, using seasonally high-resolution Sentinel-2 images from 2015 to 2022. Results show that every index follows a yearly pattern that determines its seasonality; for GEMI index the seasonal pattern is made up of high values being reached in winter and spring, with the peak occurring primarily in spring, and low values being reached in autumn. For MNDWI index, the high values are reached in winter, and the lowest values are in summer and autumn. Concerning the building index IBI, its multitemporal graph which ranges between 0.04 and 0.1 shows no sharp variations. However, its seasonality is not completely absent as greatest values are obtained in autumn while the lowest are in spring. Regarding the indices' trends, GEMI had increases of 3.2% while IBI decreased by 2.4%, probably due to the new urban parks' apparition, as for MNDWI's trend it dropped by 23.6%.

**Keywords** – Global change, land cover, remote sensing, multitemporal, trend

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## Minimum Cost/Trend Free Fractional Factorial Designs of Resolution IV

Ahlam GUIATNI<sup>1</sup>

<sup>1</sup>Department of mathematics / University of Jijel, Algeria

[\\*ahlam.guiatni@univ-jijel.dz](mailto:ahlam.guiatni@univ-jijel.dz)

**Abstract** – Literature lacks systematic  $2^{n-k}$  fractional factorial designs of resolution IV in minimum cost of factor level changes and also resistant to the time trend without limiting the number of factors nor the fractionation number. This article addresses this problem utilizing the Normalized Sylvester-Hadamard  $2^k \times 2^k$  Matrices of order  $2^k$  and their associated saturated orthogonal arrays  $OA(2^k; 2^k - 1; 2; 2)$  in  $n = (2^k - 1)$  factors to construct by factor projection two categories of systematic fractional factorial designs: Minimum cost resolution IV fractional factorial designs ( $(2^{k-2}+1) \leq n \leq 2^{k-1}$ ) and minimum cost linear trend free resolution IV fractional factorial designs ( $2^{k-2} \leq n \leq (2^{k-1} - 2)$ ), where each fractional factorial design  $2^{n-(n-k)}$  is economic in minimum number of factor level changes and allows for the estimation of all main effects unbiased by either the linear time trend or the non-negligible two-factor interactions. The article provides for each proposed fractional factorial design  $2^{n-(n-k)}$ : The  $k$  independent generators to sequence its  $2^{n-(n-k)}$  runs by the Generalized Foldover Scheme to minimize the cost of factor level changes between successive runs and the minimum total cost of factor level changes between the  $2^{n-(n-k)}$  successive runs. Proposed systematic fractional factorial design  $2^{n-(n-k)}$  compete well and sometimes better than existing systematic fractional factorial design  $2^{n-(n-k)}$  of either resolution both in minimizing the experimental cost of factor level changes and in securing factors' resistance to the non-negligible time trend.

**Keywords** – Defining Contrast, Eperimental cost, Factor level, Generalized Foldover Scheme, Hadamard Matrices, Time trend robust run orders.

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## Impact of Humidity and Water Temperature on Alkali Reactive Concrete

Fouzia BOUABDALLAH<sup>1</sup>, Houria KHERICI-BOUSNOUBRA<sup>2</sup> and Mohamed FOUZI HABITA<sup>3</sup>

<sup>1</sup>Civil Engineering department/ Soils and Hydraulic Laboratory, Oum El Bouaghi University, Algeria

<sup>2</sup>Hydraulic Department/ Soils and Hydraulic Laboratory, Annaba University, Algeria

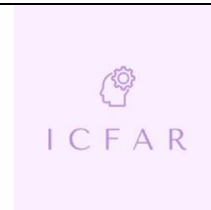
<sup>3</sup>Civil Engineering department/ Pathology and eco-materials Laboratory, Annaba University, Algeria

[\\*bouabdallah23@yahoo.fr](mailto:bouabdallah23@yahoo.fr)

**Abstract** – Water participates in the Geo-materials and environmental medium's exchange by playing a twofold role in constitutional chemical reactions and damaging of the soil components. The water contained, or in contact with geo-material influences mostly in the light of: the geo-material properties, the permanent exposure or not of the physical medium: RH, T, pressure... The water can be constitutional, adsorption pellicular or capillar; it contributes with to 85 % of the alterations risks for Geo-materials, hence the resistance and durability threat in the hydraulic structures. In this article we try to simulate Geo-materials alterations in a hydraulic concrete; whose limestone nature aggregates are very sensitive to the hyper-basic environment. Universal standards are respected in accordance with the civil engineering's art; with an experimental protocol done at the Annaba laboratories. The concrete composition is consistent with the Dreux Gorisser's method, used water for the fresh concrete mixing and the hardened concrete storage in wet and heated over-alkalized medium (RH, T). The results give a very high rate of concrete alterations, with a spectacular degradation due to severe physico-chemical conditions of the experiments and analysed by the statistical method (PCA).

**Keywords** – Concrete, Alkali Aggregate Reaction, Temperature, Water

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## Effect of Film Thickness on the Optical, Structural and Electrical Properties of Fe Doped SnO<sub>2</sub> Thin Layers Prepared by Spray Pyrolysis with Moving Nozzle

Chemsa BOUDIAF<sup>1</sup>, Boubaker BENHAOUA<sup>2</sup>, Chemsa ALI<sup>3</sup>, Allag NASSIBA<sup>4</sup>

<sup>1</sup>Department of Mechanical Engineering, El oued University, El oued, Algeria

<sup>2</sup>Department of Electrical Engineering, El oued University, El oued, Algeria

\*[nousseiba\\_allag@yahoo.fr](mailto:nousseiba_allag@yahoo.fr)

**Abstract** – In this work, undoped tin dioxide (SnO<sub>2</sub>) and iron doped tin dioxide (SnO<sub>2</sub>: Fe) thin films were deposited on 550°C heated glass using spray technique. SnCl<sub>2</sub> and Fe Cl<sub>3</sub> were used as sources of SnO<sub>2</sub> and iron doping respectively. Effects of films thickness on the optical, structural and opto-electrical properties of undoped and 6 wt. % iron doped SnO<sub>2</sub> thin films were investigated. Optical transmittance spectra of the films showed high transparency of about 76-84% in visible region. The optical gap, for SnO<sub>2</sub> and 6 wt. % Fe doped SnO<sub>2</sub> thin films, were found to be in 3.77-3.93 eV range. X-ray diffraction (XRD) patterns showed that both SnO<sub>2</sub> and SnO<sub>2</sub>: Fe films were polycrystalline with cassiterite tetragonal crystal structure. The preferential orientation for undoped SnO<sub>2</sub> was along (211) plane whereas Fe doped SnO<sub>2</sub> preferential orientations were along (200) planes. The calculated grain sizes were in 25.63-33.53nm average. Figure of merit for thin films revealed maximum value about  $9.04 \times 10^{-3} (\Omega^{-1})$  at  $\lambda = 800$  nm. The high conducting and transparent elaborated tin oxide thin films are promising to be used as window layer in solar cells.

**Keywords** – Tin oxide thin films, Spray, X-ray diffraction, Four-point probe technique, SnCl<sub>2</sub> precursor



## Optimal Design of the Manipulator for Harvesting

Saoud INAS<sup>1</sup>, Chahboun ASAAD<sup>2</sup> and Raissouni NAOUFAL<sup>3</sup>

<sup>1</sup>Department of Mathematical-Physical Sciences and New Technologies, National School of Applied Sciences Tangier, Abdelmalek Essaadi University, Morocco

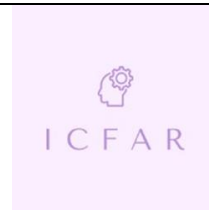
<sup>2</sup>Department of Mathematical-Physical Sciences and New Technologies, National School of Applied Sciences Tetouan, Abdelmalek Essaadi University, Morocco

[\\*inas.saoud@etu.uae.ac.ma](mailto:inas.saoud@etu.uae.ac.ma)

**Abstract** – The objective of this work is to select the structure, shape, and design parameters for the agriculture picking robot. The manipulator mounted on the mobile platform is an essential tool for harvesting; it is the main part by which the robot gets into contact with the ripe fruit which is gripped and detached from the plant with no damage. As the robot must be able to harvest the fruit autonomously between the narrow rows of the field a flexible four degree of freedom arm manipulator can complete this task. In order to determine of the optimal accessibility region for the manipulator and to reach each fruit; we select the optimal parameters of the picking robot (the angular range of the rotation joints, and length of links). We first analyze and simplify the workspace based on cultivation modes and the fruit's distribution in the field, and then we determine the manipulator's parameters using mathematical models and Matlab Global Optimization Toolbox. According to the results, the length of the three primary links are  $l_1=0.35\text{m}$  and  $l_2=l_3=0.4756\text{m}$ . To verify the effectiveness of the values taken, we carry out the simulation of the manipulator workspace. The results showed that the workspace of the selected parameters for the manipulator includes the distribution of all fruits for the studied field. So, we adopt the structure designed for the manipulator for this type of environment that meets the requirement of the harvesting task.

*Keywords* – Arm manipulator, harvesting, workspace, optimal parameters, four degree of freedom

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## Detection of Adulteration of Grape Molasses by Physicochemical Parameter

S. CHERIGUI<sup>1</sup>, I. CHIKHI<sup>2</sup> and H F. DERGAL<sup>3</sup>

<sup>1</sup>Laboratory of catalysis and synthesis in organic chemistry (LCSCO) - University of Tlemcen, chemistry, Tlemcen, Algeria.

<sup>2</sup>University Ain Temouchent Belhadj Bouchaib, Chemistry, Ain Temouchent, Algeria.

<sup>3</sup>Center for Scientific and Technical Research in Physicochemical Analysis (CRAPC), Chemistry, Alger, Algeria.

[\\*Cheriguismir1992@gmail.com](mailto:Cheriguismir1992@gmail.com)

**Abstract** – Grape molasses is a rich source of necessary vitamins, minerals, and health due to its significant nutritional value. Numerous therapeutic advantages include improved bone health and care for diabetic individuals. One of the most sought-after molasses is grape molasses. Food. In Algeria, grape molasses is used as a sugar substitute or as a sweetener in baked goods. It can be used to make syrup or biscuits and has an ecru color. Due to its numerous advantages, some people have abused it by employing certain techniques in the fraud process to raise the profit margin. The most popular and widely used technique involves adding carbohydrates like glucose, fructose, and sucrose. We gathered various samples of Algerian grape molasses in various parts of the nation, and we conducted physicochemical studies to distinguish between pure and adulterated grape molasses. For the purpose of this study, more than five samples were collected, and more than forty samples of adulterated grape molasses were made by adding glucose, fructose, and sucrose at varying weight percentages ranging from 5% to 50%. We used analyses of physico-chemical parameters to compare (electrical conductivity, pH, free acidity and index of refractometer) between pure grape molasses and adulterated grape molasses. This procedure consequently made it simple for us to determine if a grape molasses sample was pure or adulterated.

*Keywords* – physicochemical parameter, sugars, grape molasses, adulteration

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## The Structural, Electronic, Magnetic, Mechanical, and Lattice Dynamical Properties of the Novel Full Heusler Alloys Mn<sub>2</sub>HfX (X= Si And Ge). Ab-Initio Study

Mohamed LAMINE BELKHIR<sup>1</sup> and Benmalek AIDA<sup>2</sup>

<sup>1</sup>Laboratoire de Physique des Matériaux/ Université Amar Telidji de Laghouat ; BP37G, Laghouat 03000, Algeria

<sup>2</sup>Material sciences department/ Materials Physics Laboratory, Université8 Mai 1995, Guelma, Alegria.

\*[ma.belkheir@lagh-univ.dz](mailto:ma.belkheir@lagh-univ.dz)

**Abstract** – Through first-principles investigation, two new Mn<sub>2</sub>-based full Heusler alloys, Mn<sub>2</sub>HfSi and Mn<sub>2</sub>HfGe, have been studied using the full-potential linearized augmented plane wave (FP-LAPW) approach as implemented in the WIEN2k code. Our study focuses on these compound's stability (thermodynamic, dynamic, and mechanical), electronic, and magnetic properties. The L2<sub>1</sub> (Cu<sub>2</sub>MnAl-type) structure is shown to be more energetically favorable than the XA (Hg<sub>2</sub>CuTi-type) structure for both compounds, Mn<sub>2</sub>HfX (X= Si, Ge). We demonstrate that Mn<sub>2</sub>HfX (X= Si, Ge) are stable through the calculations of cohesive, formation energies, phonon dispersion curves, and the elastic constant's, with the illustration of 3D and 2D bulk and Young moduli. Using GGA and GGA-mBJ calculations show that Mn<sub>2</sub>HfX (X= Si, Ge) are half-metallic ferrimagnets (HMFs), with indirect bandgap through the altered Becke-Johnson (mBJ), GGA approximation: 0.689 eV for Mn<sub>2</sub>HfSi and 0.520 eV for Mn<sub>2</sub>HfGe. Furthermore, the electrons at the Fermi level (E<sub>F</sub>) were fully spin-polarized. The total magnetic moment in these two compounds was found to have an integer value of 2 μ<sub>B</sub> per formula, which complies with the Slater-Pauling rule M<sub>tot</sub> = Z<sub>tot</sub> - 24. These compounds are favorable materials for spintronic applications. It was revealed that Mn<sub>2</sub>HfSi and Mn<sub>2</sub>HfGe maintained their half-metallicity for lattice constants in the range of 5.7– 6.2 Å and 5.75– 6.2 Å, respectively.

**Keywords** – DFT, Wien2K, Full Heusler alloys, Half metallic, Slater-Pauling, Spintronic



## Degenerate Reaction-Diffusion Model with Nonlocal Dirichlet Boundary Condition and Its Applications

Samiha DJEMAI<sup>1</sup> and Salim MESBAHI<sup>2</sup>

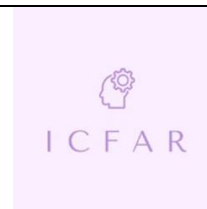
<sup>1</sup>*Department of Mathematics, Ferhat Abbas University, Algeria*

[\\*samiha.djemai@univ-setif.dz](mailto:samiha.djemai@univ-setif.dz)

**Abstract** – This paper deals with a degenerate reaction-diffusion system with coupled nonlinear localized sources subject to weighted nonlocal Dirichlet boundary conditions. We obtain the conditions for global and blow-up solutions. The model studied appears in the modeling of many diffusion phenomena in various sciences, particularly in biology and ecology.

**Keywords** – *degenerate reaction-diffusion system, nonlocal boundary conditions, blow-up, blow-up rate*

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## Synthesis, Structural Characterization, Thermal

### Stability and Biological Activities of a New Proton-Transfer Material

Safaa HIDAOU<sup>1</sup>, Mohammed LACHKAR<sup>2</sup> and Brahim EL BALI<sup>3</sup>

<sup>1</sup>Engineering Laboratory of Organometallic, Molecular Materials, and Environment, Faculty of Sciences, University Sidi Mohamed Ben Abdellah, 30000 Fez, Morocco

<sup>2</sup>Independent Scientist, Oujda, Morocco, ORCID: 0000-0001-6926-6286

[\\*HIDAOUISafaa@gmail.com](mailto:HIDAOUISafaa@gmail.com)

**Abstract** – A novel manganese (II) dihydrogenphosphate tetrahydrate, has been synthesized by using slow evaporation method, in the presence of manganese carbonate  $MnCO_3$ , phosphoric acid  $H_3PO_4$  and water  $H_2O$ . Single crystal X-ray diffraction analysis showed that the compound crystallizes in the P-1 triclinic space group, with the following unit cell parameters ( $\text{\AA}$ ,  $^\circ$ )  $a = 7.788(3)$ ,  $b = 7.881(3)$ ,  $c = 9.322(4)$ ,  $\alpha = 66.90(4)$ ,  $\beta = 84.75(2)$ ,  $\gamma = 72.71(3)$ ,  $V = 502.3(3) \text{\AA}^3$  and  $Z=2$ . The structure type of  $Mn[PO_3(OH_2)] \cdot 4H_2O$  consists on  $Mn^{2+}$ ,  $[PO_3(OH_2)]^-$  ions and water molecules. The  $MnO_6$  octahedra are running parallel to  $[001]$  and constituting the edge sharing chains. Those chains are linked by  $PO_4$  phosphate tetrahedra which share four corners in three different directions with the chains of octahedra and thus form 3D network. The Fourier transform infrared spectrum showed characteristic bands corresponding to the phosphate group and the organic amine. The thermal behavior of the compound consisted mainly of the loss of its water molecules. The biological tests exhibited significant activity against *Escherichia coli* strains in all used concentrations, while less inhibitory activity was pronounced against *Pseudomonas aeruginosa* ATCC27653 (650  $\mu\text{g/mL}$ ).

**Keywords** – crystal, X-ray diffraction, FTIR, Thermal behavior, Biological activities



## Comparison of Some Alternatives to the NTRU Cryptosystem

Eqbal NAJI HAMEED<sup>1</sup>

<sup>1</sup>Department of Mathematics, Kufa University, College of Education, Al Najaf, Iraq

[\\*iqbalnajv@gmail.com](mailto:iqbalnajv@gmail.com)

**Abstract** – Because of the fast advancement of modern technology, it is critical to safeguard sensitive personal data from unwanted access. Many issues have arisen as a result of this advancement; one of them is resolving the problem of security issues challenges by adopting algorithms that are very secure and cannot be exploited by adversaries. As a result, a cryptosystem that is secure and efficient is necessary. These conditions are met by NTRU, which is dependent upon  $Z[x]/(x^N - 1)$ . NTRU cryptosystem security comes from its ability to mix polynomial functions with a reduction modulo two relatively prime numbers  $p$  and  $q$ . In this paper, we will compare NTRU cryptosystem with  $CQ_{OTRU}$ ,  $CQTRU$  and  $OTRU$  cryptosystems. The  $CQ_{OTRU}$  cryptosystem was chosen as the first one to compare because it is one of the most recent cryptosystems that was established recently, and it has a higher level of security than most other cryptosystems of similar nature. In order to enhance security,  $CQ_{OTRU}$  uses a multidimensional approach based on CQ-Octonion algebra.

**Keywords** – NTRU,  $CQTRU$ ,  $OTRU$ ,  $CQ_{OTRU}$ , CQ-Octonion Algebra.

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## On a Degenerate Reaction-Diffusion Model and Its Applications

Salim MESBAHI<sup>1</sup> and Samiha DJEMAI<sup>2</sup>

<sup>1</sup>Department of Mathematics, Ferhat Abbas University, Algeria

[\\*salimbra@gmail.com](mailto:*salimbra@gmail.com)

**Abstract** – In this paper, we study a class of quasilinear parabolic degenerate reaction-diffusion systems, which have many applications in various sciences. We will be interested in proving the existence of positive maximal and minimal solutions; including the uniqueness of the positive solution. Our approach towards our goal is through the method of upper and lower solutions. Finally, we will present applications in biology and ecology.

**Keywords** – reaction diffusion systems, degenerate parabolic systems, upper and lower solutions

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## Sentinel-2 Very High-Resolution Satellite Images from 2016 to 2022 to Monitor and Assess Water Sustainability in Padova-Italy

H. NACIRI<sup>1</sup>, N. BEN ACHHAB<sup>2</sup>, F-E. EZZAHER<sup>3</sup>, N. RAISSOUNI<sup>4</sup> and A. AZYAT<sup>5</sup>

<sup>1</sup>Remote Sensing & Geographic Information System Unit (RS&GIS), Abdelmalek Essaadi University, Tetouan, Morocco

<sup>2</sup>Mathematics and Intelligent Systems (MASI), Abdelmalek Essaadi University, Tangier, Morocco

<sup>3</sup>Remote Sensing, Systems and Telecommunications (TST), Abdelmalek Essaadi University, Tetouan, Morocco

[\\*hsnaciri@gmail.com](mailto:hsnaciri@gmail.com)

**Abstract** – Water is one of the most crucial elements in our ecosystem since it is essential to maintaining the life of all living. But the growing threat posed by global change to this vital component has become a major concern and a priority field of study and research. Therefore, many biophysical indices have been quantified in order to monitor and assess water sustainability over extended periods using satellite high-resolution images which can be obtained by multiple sensors (i.e. Sentinel-2, Landsat, AVHRR, MODIS, IKONOS, etc.). Within this context, we used Sentinel-2 very high-resolution satellite images of Padova province situated in north Italy, in order to conduct a based time series trend analysis from 2016 to 2022. Also, to accurately monitor and analyze water changes in Padova-Italy, we computed 5 water biophysical indices [i.e., Normalized Difference Water Index (NDWI), Modified Normalized Difference Water Index (MNDWI), Normalized Difference Moisture Index (NDMI), Normalized Humidity Index (NHI), and Moisture Stress Index (MSI)]. The results show that the trends of NDWI, MNDWI, and MSI indices has decreased from 2016 to 2022 by 28%, 14.9%, and 8%, respectively. NDMI and NHI indices have shown an upward trend, with a rise of 21,9% and 10.8%, respectively.

**Keywords** – Water biophysical index, Time series, Trend, Sentinel-2.

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## Wind–Thermal Economic Dispatch Problem with Voltage Stability Enhancement Using Moth-Flame Optimization Algorithm

Arif BOURZAMI<sup>1</sup>, Mohammed AMROUNE<sup>2</sup> and Abdelkader BOUKAROURA<sup>3</sup>

<sup>1</sup>Department of electrical engineering, University of Ferhat Abbes Setif 1, Setif, 19000, Algeria

<sup>2</sup>Department of Electrical Engineering, University of Kasdi Merbah, Ouargla, 30000, Algeria

\*[mohammed\\_amroune@univ-setif.dz](mailto:mohammed_amroune@univ-setif.dz)

**Abstract** –The present paper aims to analyze the optimal power flow in the power system combining stochastic wind power with conventional thermal generators using a recently developed optimization algorithm named the moth-flame optimization (MFO) algorithm. The Weibull-based probability density function (PDF) is used to describe the stochastic nature of wind speed and wind power. Three objective functions are considered, including wind-thermal generation cost, active power loss and voltage stability. The wind generation cost model comprises three components: direct cost, overestimation cost for wind power surplus and underestimation cost for wind power shortage. To evaluate the effectiveness of the proposed method, the standard and modified IEEE 30-bus test system with wind farms is considered. The obtained results show the suitability and effectiveness of the MFO algorithm against the other optimization techniques.

**Keywords** – Optimal power flow, Wind power generation, Voltage stability enhancement, moth-flame optimization

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## Applying Algorithm D.O.E Optimization in Spot Welding Process

Hamdani NESRINE<sup>1</sup>, Mohammed CHAIB<sup>2</sup>, Abdelkader SLIMANE<sup>3</sup>, Kaddour BAHRAM<sup>4</sup>, Lebbal HABIB<sup>5</sup>, Abdelkader ZIADI<sup>6</sup> and Boualem NOUREDDINE<sup>7</sup>

<sup>1</sup>Institut des sciences et techniques appliquées, Université Ahmed Ben Bella Es Senia Oran 1 B.P. 1524-El M'naouer, Oran, Algérie.

<sup>2</sup>Smart Structures Laboratory (SSL) University of Ain Témouchent-BelhadjBouchaib, Algeria.

<sup>3</sup>Université des Sciences et de la technologie d'Oran Mohamed Boudiaf, USTO-MB, BP 1505, El M'naouer, 31000 Oran, Algérie.

<sup>4</sup>Department of Mechanical Engineering, University of Ain Témouchent-BelhadjBouchai, Algeria

[\\*pro19moh@hotmail.com](mailto:pro19moh@hotmail.com)

**Abstract** – A welding technique called opposition spot welding uses the non-fusible terminal obstruction welding standard, in which the temperature rises to reach the metal's melting point and is then combined with a high mechanical strain. The metal sheets that will be welded together are packed between two copper cathodes that are not connected, and a powerful current is used to pass through them. We have divided our job into two parts. A trial portion and a second portion on which we will enhance the exploratory results using the design of experiment (DOE), to research and see the effects of the boundaries of opposition spot welding such as: current power, welding time, and sheet thickness.

**Keywords** – Resistance spot welding, design of experiments, peak load, current intensity, welding time, sheet thickness

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## Numerical Study of an Energy Approach to Fatigue Crack Propagation Under Variable Amplitude Loading

Mohammed CHAÏB<sup>1</sup>, Hamdani NESRÏNE<sup>2</sup>, Ait KACÏ DJAFAR<sup>3</sup>, Slimane ABDELKADER<sup>4</sup>, Boualem NOUREDDÏNE<sup>5</sup>, Adjeloua ABDELAZÏ<sup>6</sup>, Habib ACHACHE<sup>7</sup>

<sup>1</sup>*Institut des sciences et techniques appliquées, Université Ahmed Ben Bella Es Senia Oran 1 B.P. 1524-El M'naoer, Oran, Algérie.*

<sup>2</sup>*Department of Mechanical Engineering, University of Djillali Liabes Sidi Bel Abbès, Algeria.*

<sup>3</sup>*Mechanical Engineering Faculty, USTO MB Oran BP 1505 El- M'Naouar, Oran, Algeria*

<sup>4</sup>*Laboratory of Composites Structures and Innovative Materials (LCSIM),*

<sup>5</sup>*University Oran2 Mohamed Ben Ahmed, Algeria*

[\\*pro19moh@hotmail.com](mailto:pro19moh@hotmail.com)

**Abstract** – This work is a contribution to the numerical study of an energy approach to fatigue crack propagation, conducted mainly on aluminum and its application to simple overload alloys. It has now been found that the application of a cycle of overload during a fatigue crack propagation leads to a slower velocity, this effect is expressed by an increase of the lifetime of the structure, Recent years have seen appear a large number of computer aids prediction is trying to assign a supplement this domain, which occupies a large empirical measure, these tools do not take into account only partially, and most often implicitly, the influence of various external factors and sometimes intrinsic. Therefore, the predictions they provide have a field closely related to validity assumptions of development and should therefore be extended to real structures with caution.

*Keywords* –specific energy, Crack velocity, hysteretic energy, overload, Energetic model

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## Legume-Grass Associations Under the Effect of Two Water Treatments in the Semi-Arid Zone of Algeria

Bourahla AMEL<sup>1</sup> and Chennafi HOURIA<sup>2</sup>

<sup>1</sup>Department of Agricultural Sciences, Faculty of Nature and Life Sciences and Earth and Universe Sciences. University Mohamed El Bachir El Ibrahimi of Bordj Bou Arreridj, 34000. Algeria

<sup>2</sup>Department of Agricultural Sciences, Faculty of Nature and Life Sciences. Ferhat Abbas Setif University, 19000. Algeria

<sup>3</sup>Natural Biological Resources Development Laboratory (VRBN), (LVRBN).

[\\*amelbourahla@univ-bba.dz](mailto:amelbourahla@univ-bba.dz)

**Abstract** – Throughout the ages, livestock farming in Algeria has kept a traditional character, based on nomadism and the exploitation of natural resources such as the highlands. In the semi-arid regions of Algeria, the use of leguminous plants and in particular the use of associated vetch on fallow land should be able to improve the feeding ratio of herds within the framework of sustainable development. Thus, the behaviour and characterization of associated fodder crops is essential to be able to choose the best feed from the point of view of better animal production. Trials conducted at the experimental station of the University of Setif, and a pilot farm in Bordj Bou Arreridj, have compared two associations vetch-bar and vetch-triticale, the results show that the vetch-triticale association is the most productive, the triticale adapts well to the conditions of excess water for a land where the clay rate is high, in parallel the vetch consumes less water than the fodder crops barley and triticale, so we can make the association (vetch-triticale) without taking into account the water needs of the vetch, and we gain a rich feed for our herds.

*Keywords - Associations, barley, triticale, vetch, semi-arid area*

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## Study and Simulation of Three Models for Estimation of Solar Radiations Components

Ilyas ROUGAB<sup>1</sup>, Ali CHEKNANE<sup>2</sup> and Nabil ABOUCHABANA<sup>3</sup>

<sup>1</sup>Materials, Energy Systems, Renewable Energies and Energy Management Laboratory (LMSEERGE), University Amar Telidji of Laghouat, 03000, Algeria

<sup>2</sup>LACOSERE Laboratory, University of Laghouat, Algeria

[\\*i.rougab@lagh-univ.dz](mailto:i.rougab@lagh-univ.dz)

**Abstract** – The use of solar energy has considerably increased owing to its abundance and availability worldwide. However, an important drawback for photovoltaic (PV) system-based electrical networks is the sun irradiance's sporadic nature. Thus, accurate data of solar irradiance are essential to ensuring steady energy output. In this paper, we propose three models used to estimate and predict the components of solar radiation at ground level (direct, diffuse and global), we simulate and compare the results obtained by simulation of these models by the measured data found in some sites where such measurements are available in Algeria. We study three empirical models: Capderou, Lacis & Hansen and Liu & Jordan models; the proposed models use as input the day number and the solar constant, in addition to the primary meteorological parameters, such as relative humidity, temperature, and pressure, as well as the geographical parameters of the site: longitude, latitude, and altitude. The aim is to estimate the solar radiation components during all the seasons of year for studied position and for considered day. The simulation results of the three models revealed that the Capderou model provide a superior approximation of solar components with insignificant deviations between observed and computed values. We can say that this model is good model for estimation of solar radiation at ground.

*Keywords* – Solar radiation, solar components (direct, diffuse, global), semi empirical models, Root mean square error

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## Mass Loss, Compressive Strength and Ultrasonic Pulse Velocity of Concrete Produced with Waste Materials After Exposure to High Temperature

Mohammed KHATTAB<sup>1</sup>, Samya HACHEMI<sup>2</sup>, Hicham BENZETTA<sup>3</sup> and Oday JARADAT<sup>4</sup>

<sup>1</sup>Department of Civil Engineering and hydraulics, University Mohamed Khider, Biskra, Algeria

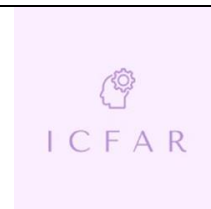
<sup>2</sup>Department of Civil Engineering, Université Ziane Achour, Djelfa

\*[mohammed.khattab@univ-biskra.dz](mailto:mohammed.khattab@univ-biskra.dz)

**Abstract** – The utilization of construction and demolition waste in the production of sustainable construction materials has recently attracted much attention due to the low cost of waste materials and also the improvement of concrete properties. However, structures produced from construction and demolition waste need to be examined when subjected to various conditions, especially when exposed to high temperatures. Exposure to elevated temperatures causes progressive failure of concrete structures and, therefore, severe deterioration and damage to the load-bearing capacity. Thus, this study attempted to explore the performance of concrete containing Refractory Brick Wastes (RRW), replacing natural coarse aggregate by 20%, under high temperatures of 20°C, 150°C, 250°C, 400°C, 600°C and 800°C. For this purpose, some physical and mechanical properties of concrete, namely the mass loss, compressive strength and Ultrasonic Pulse Velocity (UPV) were examined after exposure to heat. The results indicate a notable deterioration in the physical and mechanical properties of the concrete specimens as temperature increases. However, the decrease in the physical and mechanical properties of mixes containing 20% of coarse RBA at high temperatures is not that significant compared to concrete containing 100 % of coarse and fine natural aggregates. In the end, RBAs have the potential to be incorporated into the concrete mixes at high temperatures since the fire resistance of concrete containing 20% of coarse RBA was enhanced.

*Keywords* – High temperature, recycled concrete, sustainable construction materials, construction and demolition waste

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## Importance of Precursor Type in Fabrication ZnO Thin Films by Spray Pyrolysis for Photocatalytic Applications

Nassiba ALLAG<sup>1</sup>, Chahinaz SIAD<sup>2</sup>, Omar BEN MYA<sup>3</sup> and Boudiaf CHEMSA<sup>4</sup>

<sup>1</sup>Department of Mechanical Engineering, El oued University, El oued, Algeria

<sup>2</sup>Department of Matter Sciences, University of Biskra, Biskra, Algeria

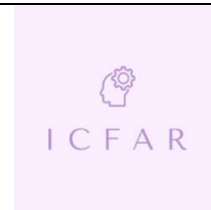
<sup>3</sup>Department of petrochemical process Engineering, El oued University, El oued, Algeria

\*[nousseiba\\_allag@yahoo.fr](mailto:nousseiba_allag@yahoo.fr)

**Abstract** – The importance of choosing an appropriate precursor with right molarity for the fabrication of zinc oxide (ZnO) films by spray pyrolysis with moving nozzle for the photocatalytic application is reported. Films were grown on glass substrates by using two different zinc precursors such as zinc acetate, and zinc chloride. The structural, morphological, and optical characterizations were performed on the ZnO films. A preferential orientation along (002) plane, crystallite size distribution in the range 45-73 nm, and the nanostructures such hexagonal was acquired from the characterization studies. Further, the photocatalytic activity was tested using ions of copper, obtaining 70% of degradation using the ZnO thin films deposited with zinc acetate, whereas films from zinc chloride precursors showed 20% of degradation.

**Keywords** – Zinc oxide thin films, Spray, X-ray diffraction, Photocatalytic, copper precursor

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## Investigations of Mechanical and Thermoelectric Properties of 'Cozrmnin' Novel Half-Heusler Alloy

Khadhraoui ZAKARIA<sup>1</sup>, Amara ABDELAZIZ<sup>2</sup> and Labidi SALIMA<sup>3</sup>

<sup>1</sup>LEAM Laboratory, Department of physics, Faculty of Science, Badji Mokhtar University

<sup>2</sup>LNCTS Laboratory, Department of chemistry, Faculty of Science, Badji Mokhtar University

[\\*zakikhadraoui7@gmail.com](mailto:*zakikhadraoui7@gmail.com)

**Abstract** – In this study, the EQH CoZrMnIn compound is investigated using Density Functional Theory (DFT). The generalized gradient approximation with Tran-Blaha potential (GGA + mbJ) was utilized to treat the exchange-correlation energy for the calculations of electronic structures. The three structural types type-I, type-II, and type-III are considered to determine the most stable structural types of CoZrMnIn compound. Furthermore, two magnetic configurations as paramagnetic (PM) and ferromagnetic (FM) are studied to find out the most stable magnetic configuration. The type-I FM configuration is the most stable configuration for the CoZrMnIn compound. The calculated electronic band structures reveal that the CoZrMnIn alloy is half-metal with metallic behavior in the spin-up channel and semiconducting behavior in the spin-down channel. Also, the elastic constants reveal that the CoZrMnIn is mechanically stable and the Poisson's ratio confirmed that the alloy considered is brittle.

**Keywords** – Wien2k, half-heusler, structural properties, half-metal

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## Numerical Simulation to Study the Horizontal Homogeneity of the ABL by Using CFD Approach

Anas SOFI<sup>1</sup>, Narjisse AMAHJOUR<sup>2</sup> and Abderrahman EL KHARRIM<sup>3</sup>

<sup>1</sup>Team: Energy, Materials, Numerical physics, Ecole Normale Supérieure (ENS) Tetouan, Abdelmalek Essaadi University, Morocco

<sup>2</sup>Department of Physics, Faculty of science Tetouan, Abdelmalek Essaadi University, Morocco

\*[anas.sofi@gmail.com](mailto:anas.sofi@gmail.com)

**Abstract** – The performance of a wind farm depends on the characteristics of the flow as well as the atmospheric boundary layer, but these vary according to the thermal stability conditions, the roughness and the topography of the ground on which the farm was construct. A big issue that effects the performance of CFD simulations in flat-terrain is the incoherence profile of the atmospheric boundary layer (ABL). The goal of this work is to analysis the impact level of imposed boundary conditions in the thermo-fluid coupled interface on the homogeneity Horizontal of ABL in CFD simulations on a flat terrain by using CFD commercial code COMSOL Multiphysics. This study mentioned the inlet conditions for neutral ABL when used in combination with scalable wall function with roughness. The horizontal homogeneity by the profile is tested by 2D Reynolds-Averaged Navier-Stokes (RANS) coupled with standard k-ε turbulence model. The results show that ABL inconsistent profiles can be a major cause of inaccuracy and can degrade efficiency of airflow forecasts in a wind farm located on complex terrain.

*Keywords* – CFD, Turbulence, Atmospheric Boundary Layer, Neutral, Airflow

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## Towards a Based-GIS Urban Planning and Management Information System

Ikrame ABROUN<sup>1</sup>, Abdelilah AZYAT<sup>2</sup>, Nizar BEN ACHHAB<sup>3</sup>, Naoufal RAISSOUNI<sup>4</sup> and Asaad CHAHBOUN<sup>5</sup>

<sup>1</sup>RS&GIS Lab Remote Sensing GIS Unit, ENSA of Tetouan, Morocco

<sup>2</sup>ERMIA Unit, ENSA of Tangier, Morocco

[\\*Abroun.ikrame9@gmail.com](mailto:Abroun.ikrame9@gmail.com)

**Abstract** – Alarmingly fast and unplanned urbanization is happening all throughout the world. Land use and urban sprawls have emerged as two of the most important and pressing concerns in urban studies as cities expand upward and outward. The city's boundaries begin to extend along the urban periphery as population and activity levels rise, which leads to fragmented urban morphology that has an adverse effect on the environment and local ecology. GIS technology is being used in a wider range of applications as urbanization progresses. The study objective is to design and develop a system to identify and track the spatial expansion while analyzing changes in land use and land cover. Before the full impact of land use change is apparent, this activity often entails the identification of emergent land use patterns, which are typically linked with other planning indicators like employment, housing, and population. A rational planning strategy can greatly enhance the quality of planning and decision-making by handling valid data effectively and quickly. A GIS database design and customized applications for planning and tracking the growth of the urban regions will be treated, in this paper. In addition to, a user interface and modeling will be presented along with the application and analysis to make the system's use simple and accessible. Besides, to a web-based GIS for the study area will also be created in order to integrate the data collection and to promote data sharing across different agencies so that they can participate in influencing the urban environment in the region.

*Keywords* – GIS, urban sprawls, urban planning, land use, urbanization

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## The Turbine Inlet Temperature and the Fluid Flow Rate Effect on the Organic Rankine Cycle

Dhikra DERBAL<sup>1</sup> and Abderrezak ABDALLAH<sup>2</sup>

<sup>1</sup>Research Laboratory of Industrial Risks, Non Destructive Control and Operating Safety, University of Badji Mokhtar, Annaba, Algeria

<sup>2</sup>Research Laboratory of Industrial Risks, Non Destructive Control and Operating Safety, University of Badji Mokhtar, Annaba, Algeria

[\\*derbaldhikra@gmail.com](mailto:derbaldhikra@gmail.com)

**Abstract** – Organic Rankine cycle systems recover heat from low and medium temperature heat sources and work an organic fluid with a high density. The optimal thermodynamic parameters are those which allow high thermal efficiency and high heat transfer from the heat source to the thermodynamic cycle. Consequently, this study interests in the effect of the working fluid flow rate and the turbine inlet temperature on the organic Rankine cycle performance. A preliminary design of the cycle is proposed considering Ethane as a working fluid. An evaluation of the turbine inlet temperature and the working fluid flow rate is conducted to assess their effect on overall cycle performance. The obtained results show that the mass flow rate has almost a negligible effect, whereas the inlet temperature of the turbine has a considerable effect on the cycle performance caused by the increase of the fluid thermal energy and consequently the power output and the total energy efficiency. Respecting the superheating limits to avoid the blades damage and the turbine performance degradation, the increase of the temperature improves the overall performance system from 20.61% (for  $T_{in,T} = 60$  °C) to 28.05% (for  $T_{in,T} = 120$  °C). Thus, the increase with 60 °C enables an improvement rate of 36%.

**Keywords** – Energy Efficiency, Flow Rate, Organic Rankine Cycle, Temperature, Working fluid

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## Structural, Microstructural, and Optical Properties of Nickel Doped Tin Oxide Films by PSP Method

Roguai SABRINA<sup>1</sup> and Djelloul ABDELKADER<sup>2</sup>

<sup>1</sup>Department of science of the matter, Abbes Laghrour university, khenchela, Algeria

[\\*rog.sabrina@yahoo.fr](mailto:*rog.sabrina@yahoo.fr)

**Abstract** – In this study, we used a pneumatic spray pyrolysis technique at 450°C to deposit Sn<sub>1-x</sub>Ni<sub>x</sub>O<sub>2</sub> thin films (0.0 ≤ x ≤ 0.10) on glass substrates. The influence of doping content on the films structural and optical was investigated. Structural characterization by X-ray diffraction indicated that the rutile phase of SnO<sub>2</sub> is present in all thin films, and crystallite sizes are estimated to be in the range of 27–47 nm. The optical bandgap energy increases from 3.83 to 4.01 eV as the dopant content increases according to the Burstein-Moss effect. Resistivity is affected by doping and the thickness of thin films.

**Keywords** – Thin films, X-ray diffraction, Optical properties

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## **Crime and Deviation Detective, University of Annaba-Algeria the Effect of Socialization on the Behavior of Young Offenders**

Sahraoui AMARA<sup>1</sup>

<sup>1</sup>*Crime and delinquency Laboratory Baji Mukhtar Annaba University Algeria*

[\\*sahraouiamara420@gmail.com](mailto:*sahraouiamara420@gmail.com)

**Abstract** – The institutions of socialization in any of the societies play a pivotal role in building the personality of the juvenile and its growth in a way that makes him a normal person in his society, committed to the rules of social control and its requirements, through a set of value and moral systems that these institutions seek to integrate into the personality of the juvenile, which are patterns that the society adopts and accepts. It is the basis of normal social relations, as well as the existing social system, all with the aim of protecting the juvenile and immunizing him from all social stimuli that may motivate him to enter the world of crime and delinquency.

*Keywords* – socialization, deviant behavior, juveniles

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## Oxidative Bromination in Aqueous Medium Using Copper and Oxovanadium Complexes

Boucekine IKRAM<sup>1</sup> and Kamel OUARI<sup>2</sup>

<sup>1</sup>Laboratory of Electrochemistry, Molecular Engineering and Redox Catalysis, Faculty of Technology, Ferhat Abbas University, Setif 19137, Algeria.

<sup>2</sup>Laboratory of Electrochemistry, Molecular Engineering and Redox Catalysis, Faculty of Technology, Ferhat Abbas University, Setif 19137, Algeria.

\*[boucekine.ikram@hotmail.com](mailto:boucekine.ikram@hotmail.com)

\*[kamel\\_ouari@univ-setif.dz](mailto:kamel_ouari@univ-setif.dz)

**Abstract** – Vanadium and copper complexes have long been studied due to their biological and catalytic properties in systems such as haloperoxidation, nitrogen fixation, metalloproteins, and insulin mimicking. The chemistry of vanadium haloperoxidases (V-HPOs) has grown in popularity, owing to their ability to accelerate oxidative halogenation and the oxidation of aliphatic and aromatic organic substrates in the presence of hydrogen peroxide or molecular oxygen.

We investigated a new oxidovanadium(IV) complex (VOL) containing a N<sub>2</sub>O<sub>2</sub> donor Schiff base ligand. CHN analysis, <sup>1</sup>H and <sup>13</sup>C NMR, UV-Vis and FT-IR spectra were used to characterize the synthesized Schiff base ligand and its corresponding oxovanadium complex.

The single crystal was used to investigate the crystal structure of the VOL complex. X-ray diffraction analysis, which explores a distorted square pyramidal geometry of the vanadium center [1]. The electrochemical characterization of the VOL complex was carried out by using the cyclic voltammetry (CV). The vanadium center gives a quasi-reversible redox couple near 500 mV corresponding to VIV/VO process and an irreversible cathodic peak near -800 mV due to the reduction of VIV/III O. The additional peaks in the CVs growing with the scan rate can be attributed to consecutive one-electron reduction of ligand. Bromination reaction activity of the VOL complex, in phosphate buffer with phenol red as organic substrate in the presence of H<sub>2</sub>O<sub>2</sub> and Br, has been evaluated by UV/Vis spectroscopy [2]. The results indicate that the VOL catalyst can be considered as potential functional model vanadium-dependent haloperoxidases, a practical application of H<sub>2</sub>O<sub>2</sub> detection was firstly observed in the catalytic reaction system.

**Keywords** – Vanadium, Schiff base, cataly

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## Complex Systems as a Unifying Framework Across Mathematics, Natural Sciences, and History

Rafik BELGHIT<sup>1</sup>, Mohamed AOUNALLAH<sup>2</sup>, Hicham BELGHIT<sup>3</sup>, Chaima BELGHIT<sup>4</sup>, Salah AOUN<sup>5</sup>, Nabti NADJWA<sup>6</sup> and Malki RIMA<sup>7</sup>

<sup>1</sup>Annaba University, ALGERIA

<sup>2</sup>Tebessa University, ALGERIA

[\\*hsilent4@gmail.com](mailto:hsilent4@gmail.com)

**Abstract** – This paper examines how data-driven methods at the intersection of mathematics, physics, chemistry, and biology are reshaping research practices, and how historical inquiry can inform the ethical and societal dimensions of this transformation. The first part surveys recent advances in machine-learning-based modeling of physical and chemical processes, as well as large-scale biological data analysis, highlighting the central role of statistical inference, optimization, and high-performance computation. It shows how these techniques enable new forms of prediction, design, and discovery, while also introducing challenges related to interpretability, reliability, and bias. The second part situates these developments within a longer history of quantification, measurement, and classification in science, tracing continuities from early experimental record-keeping and standardized units to contemporary big-data infrastructures and automated laboratories. By comparing past and present practices, the paper argues that many current dilemmas surrounding data ownership, opacity of methods, and unequal access to computational resources have historical precedents that can guide critical reflection today. Building on this integrated analysis, the study proposes a set of principles for more responsible data-intensive research, emphasizing transparency, reproducibility, and attention to social context. The paper thus links technical advances in data science with historically informed ethical considerations, offering a multidisciplinary perspective relevant to researchers across the sciences and humanities.

*Keywords* – Complex systems, Nonlinear dynamics, Network theory, Self-organization Emergence, Historical dynamics

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## Oil Well Production Optimization Using Extended Reach Drilling (Erd) Technique

Younus SAMEER<sup>1</sup>, Maria STOICESCU<sup>2</sup> and Timur CHIS<sup>3</sup>

<sup>1</sup>Ph.D. School, Petroleum-Gas University Ploiesti, Romania

<sup>2</sup>Oil and Gas Engineering Faculty, Petroleum-Gas University Ploiesti, Romania

<sup>3</sup> Oil and Gas Engineering Faculty, Petroleum-Gas University Ploiesti, Romania

[\\*timur.chis@gmail.com](mailto:timur.chis@gmail.com)

**Abstract** – This study investigates the potential of Extended-Reach Drilling (ERD) as a production optimization technique for oil wells in a Middle East onshore field. A 10-year dynamic production simulation was conducted to compare an ERD well (Well A) with a conventional vertical well (Well B) under identical reservoir and economic conditions. The ERD well demonstrated a 35% higher initial production rate and a 53.7% greater cumulative recovery after ten years, primarily due to enhanced reservoir contact length, improved inflow distribution, and reduced pressure drawdown. Economic evaluation at an oil price of \$62/bbl indicated a net present value (NPV) of USD 79.94 million for the ERD well, compared to USD 52.20 million for the conventional design, yielding an incremental gain of USD 27.74 million and a payback period of approximately one year. Sensitivity analysis across varying oil prices confirmed that ERD remains economically robust even under conservative market conditions. The results validate that ERD significantly enhances production efficiency and project profitability while reducing surface footprint and infrastructure needs. Therefore, ERD represents a technically and economically viable solution for optimizing recovery from elongated or thin reservoirs. The findings provide a quantitative framework for field operators to integrate ERD within production optimization strategies, supported by improved reservoir management and long-term economic sustainability.

*Keywords* – Extended-Reach Drilling, Oil and Gas Drilling, Optimisation, Production

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## Feasibility Study to Convert a Highly Deviated J-Shape Well to Extended Reach Well ERD. a Torque and Drag Analysis Case

Younus SAMEER<sup>1</sup>, Maria STOICESCU<sup>2</sup> and Timur CHIS<sup>3</sup>

<sup>1</sup>Ph. D.School, Petroleum-Gas University Ploiesti, Romania

<sup>2</sup>Oil and Gas Engineering Faculty, Petroleum-Gas University Ploiesti, Romania

<sup>3</sup> Oil and Gas Engineering Faculty, Petroleum-Gas University Ploiesti, Romania

[\\*timur.chis@gmail.com](mailto:timur.chis@gmail.com)

**Abstract** – The economic viability of mature fields often hinges on maximizing reservoir drainage from existing wellbores. This study presents a comprehensive feasibility analysis for converting a highly deviated J-shape well into an Extended Reach Drilling (ERD) wellbore to access untapped hydrocarbon targets. The core of the investigation is a rigorous Torque and Drag (T&D) analysis, which serves as the primary metric for assessing the mechanical feasibility of the well extension.

The analysis critically evaluates the loads imposed on both a conventional Positive Displacement Motor (PDM) and a modern Rotary Steerable System (RSS) Bottom Hole Assembly (BHA). Key operational limits, including available surface torque, hoisting capacity, and buckling constraints, were benchmarked against simulated predictions for sliding, rotating, and tripping scenarios under varying open-hole and cased-hole friction factors.

The results conclusively demonstrate that converting the well to an ERD profile is technically feasible with an RSS BHA, which significantly reduces torque and drag compared to a PDM assembly, thereby staying within the operational envelope. However, the analysis also identifies critical friction thresholds that, if exceeded, would jeopardize the project's success. This study provides a critical decision-making framework and underscores that precise T&D modeling is not just a planning tool, but a fundamental requirement for the successful and safe execution of such a complex well conversion, ultimately unlocking additional reserves from a mature asset.

*Keywords* – Torque and Drag, Positive Displacement Motor, Rotary Steerable System, Bottom Hole Assembly, Extended-Reach Drilling, Oil and Gas Drilling

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## Influence of Substrate Nature on the Properties of ZnO Thin Films

Chargui FOUZIA<sup>1</sup>

<sup>1</sup>*Emergent Materials Research Unit (RUEM), Ferhat Abbas University Setif 1, 19000 Setif, Algeria*

[\\*cherguifouzia@yahoo.fr](mailto:cherguifouzia@yahoo.fr)

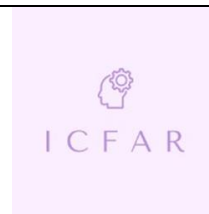
**Abstract** – Over recent decades, rapid technological progress has intensified research on advanced materials for electronic, optoelectronic, and photovoltaic applications. Among these materials, thin films play a key role due to their low thickness, high transparency, and tunable properties, which can be tailored through appropriate deposition techniques. In the context of sustainable development, materials combining non-toxicity, abundance, and recyclability have attracted growing interest. Zinc oxide (ZnO) is one such material and is widely recognized as a promising candidate for thin-film applications.

ZnO is an n-type wide-bandgap semiconductor (~3.3 eV) characterized by high optical transparency in the visible range, good chemical and thermal stability, and adjustable electrical conductivity. Its non-toxic nature and wide availability further enhance its suitability for environmentally friendly optoelectronic technologies. Consequently, ZnO thin films have been extensively investigated for applications such as solar cells, gas sensors, transparent electronics, and light-emitting diodes.

In this study, a comparative investigation of ZnO thin films deposited on two different substrates conventional glass and fluorine-doped tin oxide (FTO) coated glass is presented. FTO is a transparent conducting oxide commonly used as an electrode in photovoltaic devices. The comparison aims to elucidate the influence of substrate properties on the structural, optical, and electrical characteristics of ZnO thin films.

*Keywords* – ZnO, Thin film, FTO

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## Experimental Study of Corrosion Inhibition of Mild Steel in 0.5 M HCl by Cyn3

Chibane AMINA<sup>1</sup>, Aliouane NABILA<sup>2</sup>, Toukal LINDA<sup>3</sup>, Ait AHMED NADIA<sup>4</sup> and Djedouani AMEL<sup>5</sup>

<sup>1</sup>Department of Process Engineering/Electrochemistry and Materials Laboratory (LECV), Université A. Mira, Bejaia, Algeria

<sup>2</sup>Department of Process Engineering/Electrochemistry and Materials Laboratory (LEM), Université Ferhat Abbas Sétif-1, Sétif, Algeria

<sup>3</sup>Department of Process Engineering/Ecole Normale Supérieure de, Constantine, Algeria

[\\*minachibane1991@gmail.com](mailto:*minachibane1991@gmail.com)

**Abstract** –The cyn3 was synthesized and tested as a corrosion inhibitor for mild steel in 1.0 M HCl solution using electrochemical and spectroscopy measurements. Results obtained showed that this compound has a good inhibition property for mild steel corrosion in acidic medium which its inhibition efficiency value reaches 90 % at 10<sup>-3</sup> M. So, the potentiodynamic polarization curves showed that the cyn3 has a mixed type inhibitor. In addition, it is shown that the obtained results were confirmed by the UV-vis spectroscopic measurements. It is found that the inhibitor forms a complex with Fe<sup>2+</sup> ion.

**Keywords** – cyn3, Corrosion inhibition, Acidic medium, Electrochemical and spectroscopy measurements

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## Hydrogen Fuel Cells and Direct Reduced Iron (DRI): Toward Low-Carbon Energy and Sustainable Steelmaking

Abdelhakim BEGAR<sup>1</sup>

<sup>1</sup>*Department of Mechanical Engineering University of Biskra- Algeria*

[\\*a.begar@univ-biskra.dz](mailto:a.begar@univ-biskra.dz)

**Abstract** – The growing demand for decarbonization in both the energy and metallurgical sectors has positioned hydrogen as a key enabling technology. Hydrogen fuel cells provide an efficient and clean pathway for electricity generation through electrochemical conversion, while the Direct Reduced Iron (DRI) process offers a promising alternative to conventional blast furnace ironmaking. In hydrogen-based DRI, iron oxides are reduced using hydrogen instead of carbon monoxide, significantly lowering carbon dioxide emissions.

This paper presents a conceptual and technological overview of hydrogen fuel cells and hydrogen-based DRI processes, emphasizing their operating principles, environmental benefits, and potential for industrial integration. The synergy between hydrogen-based energy conversion and DRI-driven steel production is discussed as a viable pathway toward sustainable and low-carbon industrial systems. The study highlights hydrogen as a strategic vector linking clean energy generation and green steel manufacturing.

In addition, challenges related to hydrogen production, storage, and infrastructure are briefly addressed, together with technical constraints associated with large-scale hydrogen-based DRI implementation. Economic feasibility, energy efficiency, and process integration with electric arc furnaces (EAF) are examined to provide a realistic perspective on the transition from conventional ironmaking routes to hydrogen-driven sustainable steel production. This contribution also outlines future research directions, highlighting the need for optimized hydrogen supply chains, advanced reactor design, and comprehensive lifecycle assessments to support large-scale industrial deployment.

*Keywords* – Hydrogen fuel cells, Direct Reduced Iron (DRI), Green hydrogen, Low-carbon steelmaking, Industrial decarbonization

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## Investigation of Seismic Damages Due to Geotechnical Causes During the Kahramanmaraş Earthquakes, February 06, 2023

Burak ÇAKIL<sup>1</sup>, Mutlu ŞİMŞEK<sup>2</sup>, Ozan İNCE<sup>3</sup> and Ömer FARUK TAŞ<sup>4</sup>

<sup>1</sup>Department of Civil Engineering, Firat University, Elazig 23000, Türkiye

<sup>2</sup>Department of Civil Engineering, Erzincan Binali Yıldırım University, Erzincan 24000, Türkiye

[\\*burakk.cakill@gmail.com](mailto:burakk.cakill@gmail.com)

**Abstract** – The  $M_w$  7.7 (Pazarcık) and  $M_w$  7.6 (Elbistan) earthquakes that occurred on 6 February 2023, centered in Kahramanmaraş, have been recorded as one of the most devastating natural disasters in Türkiye's history. The severe damage and collapses observed following these earthquakes cannot be explained solely by deficiencies in structural design and construction; instead, geotechnical conditions were identified as a decisive factor governing damage in many affected areas.

In this study, geotechnical-induced seismic damage observed during the Kahramanmaraş earthquakes is reviewed with a particular focus on soil liquefaction, local site amplification, and soil–structure interaction. Field observations and analytical studies reported from various settlements—primarily Kahramanmaraş, Adıyaman (Gölbaşı), and Malatya—are comparatively evaluated, and the underlying damage mechanisms are discussed within a unified framework. The findings indicate that alluvial soils shallow groundwater levels, and inadequate soil improvement practices significantly amplified earthquake-induced damage.

**Keywords** – Kahramanmaraş earthquakes, Geotechnical seismic damage, Soil liquefaction, Local site amplification, Soil–structure interaction

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## The Digital Economy and Its Challenges for Modern Economies

Hamza GOUMRI<sup>1</sup> and Bilal THAMEUR<sup>2</sup>

<sup>1</sup>Department of Finance and Accountin /faculty of Economics, University of msila, Algeria

<sup>2</sup>Department of management sciences/ faculty of Economics, University of msila, Algeria

[\\*hamzahamzagoumri28@gmail.com](mailto:*hamzahamzagoumri28@gmail.com)

**Abstract** – The digital economy represents one of the most profound transformations affecting contemporary economic systems. Driven by rapid advances in information and communication technologies, digital platforms, big data, and artificial intelligence, economic activities are increasingly shifting toward digital environments (Schwab, 2016; OECD, 2020). This paper examines the concept of the digital economy, its key characteristics, and its growing significance for modern economies. It further analyzes the wide range of challenges associated with digital transformation, including regulatory and institutional constraints, fiscal and taxation issues, labor market disruptions, data governance, cybersecurity risks, and the persistence of the digital divide (UNCTAD, 2019; World Bank, 2021). Using a descriptive and analytical approach based on an extensive review of academic literature and international reports, the study highlights that while the digital economy enhances productivity, innovation, and global connectivity, it also introduces structural imbalances and social challenges. The paper concludes that addressing these challenges requires comprehensive policy frameworks, institutional adaptation, and long-term investments in digital infrastructure, education, and human capital to ensure inclusive and sustainable economic development.

**Keywords** – Digital Economy, Digital Transformation, Modern Economies, Economic Challenges, Digital Divide, Governance, Innovation

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## Biyometrik Karar Destek Sistemlerinde Yasal ve Etik Uyumluluk Aracı Olarak Açıklanabilir Yapay Zekâ (XAI): GDPR Ekseninde bir İnceleme

Ali ERDİ CANDAR<sup>1</sup> ve Ömer YILMAZ<sup>2</sup>

<sup>1</sup>Bilgisayar Mühendisliği /Lisansüstü Eğitim Enstitüsü, Tokat Gaziosmanpaşa Üniversitesi, Türkiye  
<sup>2</sup>Bilgisayar Mühendisliği /Mühendislik ve Mimarlık Fakültesi, Tokat Gaziosmanpaşa Üniversitesi, Türkiye

\*[alierdi.candar@gop.edu.tr](mailto:alierdi.candar@gop.edu.tr)

**Özet** – Endüstri 5.0 ve dijitalleşmeyle birlikte biyometrik sistemler, kamu güvenliği, sınır kontrolü, sağlık hizmetleri ve kimlik doğrulama gibi kritik alanlarda yaygın olarak kullanılan yüksek riskli yapay zekâ uygulamalarıdır. Yüz, parmak izi, iris, damar izi veya ses gibi benzersiz biyometrik özelliklerin geri alınamaz ve kalıcı nitelikte olması, bu sistemleri hem hukuki hem etik açıdan hassas bir konuma yerleştirmektedir. Derin öğrenme temelli biyometrik modellerin “kara kutu” niteliği, bu sistemlerin hangi gerekçelerle belirli bir kişiyi doğruladığı ya da reddettiğinin anlaşılmasını güçleştirmekte; bu durum hem hatalı kararların tespitini hem de temel hak ve özgürlüklerin korunmasını zorlaştırmaktadır.

Bu çalışma, biyometrik karar destek sistemlerinde Açıklanabilir Yapay Zekânın (XAI) rolünü, GDPR ve AB Yapay Zekâ Yasası başta olmak üzere LGPD, PIPL, PDPL, APPI ve BIPA gibi uluslararası düzenlemeler ile Türkiye’de 6698 sayılı KVKK ve ikincil mevzuat çerçevesinde karşılaştırmalı olarak incelemektedir. Çalışmada XAI’nin şeffaflık, açıklanabilirlik, hesap verebilirlik ve denetlenebilirlik ilkeleriyle hukuki temelleri ortaya konulmakta; ardından önyargı, ayrımcılık, gizlilik ihlali ve kitlesel gözetim gibi etik riskler bireysel, kurumsal ve toplumsal düzeyde tartışılmaktadır.

Elde edilen bulgular, AB düzenlemelerinin XAI’yi dolaylı veya doğrudan hukuki bir gereklilik hâline getirdiğini; Çin ve Brezilya gibi ülkelerin de açıklama ve insan müdahalesi hakları üzerinden benzer bir yönelim sergilediğini göstermektedir. Türkiye’de ise KVKK ve Kurul rehberleri XAI’yi açıkça adlandırmasa da şeffaflık, bilgilendirme, veri minimizasyonu ve izlenebilirlik ilkeleri aracılığıyla XAI gerekliliklerine kısmen zemin hazırlamaktadır. Sonuç olarak, biyometrik sistemlerde XAI’nin yalnızca teknik bir tercih değil, temel hak ve özgürlüklerin korunması için hem etik hem de giderek artan ölçüde hukuki bir zorunluluk hâline geldiği savunulmaktadır.

*Anahtar Kelimeler – Biyometrik Sistemler, Açıklanabilir Yapay Zeka (XAI), GDPR, Bilişim Etiği, Biyometrik Veri Mahremiyeti*



## Kriyojenik Sıkıştırılmalı Hidrojen Depolama Tankının Isıl Analizi

Ozan KÜTÜK<sup>1</sup> ve Eylem YILMAZ ULU<sup>2</sup>

<sup>1</sup>Otomotiv Mühendisliği Bölümü / Teknoloji Fakültesi, Pamukkale Üniversitesi, Türkiye

[\\*eyilmaz@pau.edu.tr](mailto:eyilmaz@pau.edu.tr)

**Özet** – Yıllar geçtikçe gelişen teknolojiyle birlikte ihtiyaç duyulan enerji miktarı artmaktadır. Şu an kullanılmakta olan petrol kaynakları gün geçtikçe tükenmektedir. Her geçen gün artan enerji ve yakıt ihtiyacını karşılayabilmek için çeşitli çalışmalar yapılmaktadır. Bu çalışmalar içerisinde enerji ve yakıt ihtiyacını karşılayabilecek en güçlü aday hidrojendir. Hidrojenle çalışan yakıt pili hücreleri, günümüzde petrol ile çalışan içten yanmalı motorların aksine herhangi bir emisyon gazı doğaya salmaz. Şu an elektrikli araçlarda kullanılan lityum-iyon pillerin hem üretilirken oluşturduğu karbon ayak izi hem de ömürleri bittikten sonra doğaya uygun olmayan geri dönüşüm şartlarından dolayı hidrojen potansiyeli en yüksek yakıt türüdür. Ancak hidrojenin güvenli ve verimli bir şekilde depolanması büyük bir sorundur. Bu çalışmada hidrojen depolama yöntemlerinden biri olan kriyojenik sıkıştırma ile depolama yapan hidrojen yakıt tankının ısıl analizi incelenmiştir.

*Anahtar Kelimeler – Hidrojen, Hidrojen Depolama, Enerji, Kriyojenik, Kriyojenik Depolama*



## Optimize Edilmiş Isı Alıcıda Eğimli ve Çoklu Çarpan Jetle Isı Transferinde Isı ve Akış Özelliklerinin Sayısal Analizi

Altuğ KARABEY<sup>1</sup>

<sup>1</sup>Makine Mühendisliği Bölümü, Van Yüzüncü Yıl Üniversitesi, Türkiye

[\\*akarabey@yyu.edu.tr](mailto:*akarabey@yyu.edu.tr)

**Özet** – Çeşitli endüstri sektörlerinde sistemlerin çalışması sırasında oluşan ısının, sistem ömrü ve performansı üzerinde olumsuz etkileri vardır. Bu nedenle sistemin devrede olduğu anlarda oluşan bu ısının sistemden en kısa sürede uzaklaştırılması büyük önem kazanmaktadır. Bu amaçla kullanılan çarpan hava jeti, kağıt kurutması, elektronik elemanların soğutulması, cam temperlenmesi ve gaz türbin kanatlarının soğutulması gibi pek çok endüstriyel uygulamada kullanılmaktadır. Bu çalışmada, daha önce Taguchi L<sub>27</sub>(3<sup>11</sup>) deney yöntemi ile optimize edilmiş dikdörtgen kanatçıklı ısı alıcının, açılı ve çoklu çarpan jetle ısı transfer karakteristikleri incelenmiştir. Optimize edilerek elde edilen ısı alıcıda, sabit ısı akısı ve ısı alıcı açısı ( $\alpha=10^\circ$ ) etkisinde farklı lüle çapı, H/D mesafesi ve hız değerleri etkisinin sayısal analizi gerçekleştirilmiştir. Analizler her biri dokuz nozullu üç farklı lüle çapında (d=25, 32, 40 mm), üç farklı lüle-ısı alıcı mesafesinin lüle çapına oranında (H/D=6, 7, 8) ve beş farklı hız değerinde (V=5, 6, 7, 8, 9 m/sn) gerçekleştirilmiştir. Sonuç olarak; elde edilen veriler Nusselt-Reynolds grafikleri şeklinde oluşturulmuş ve parametrelerin ısı transferine etkileri analiz edilmiştir. Nusselt sayısının artan boru çapı ve Reynolds sayısı ile arttığı buna karşın Nusselt sayısının lüle ile ısı alıcı arasındaki mesafe arttıkça azaldığı sonucuna ulaşılmıştır. Sabit ısı akısı ve ısı alıcı açısı değerlerinde, dikdörtgen kanatçıklı eğimli ısı alıcıya ait en yüksek Nusselt sayısı, D=40mm olan lüle çapında, h/d=6 boyutsuz mesafesinde ve 9m/s akış hızında hesaplanmıştır. Buna karşın en düşük Nusselt sayısı, D=25mm olan lüle çapında, h/d=8 boyutsuz mesafesinde ve 5m/s akış hızında hesaplanmıştır.

*Anahtar Kelimeler – Çoklu çarpan jet, Isı transferinin iyileştirilmesi, Zorlanmış taşınım*

# Nature-Inspired Fasteners: A Comprehensive Review of Biomimetic Tribology and Sustainable Applications in the Automotive Industry

Gökşan ŞAN<sup>1</sup>

<sup>1</sup>Design Center, ARaymond Türkiye, Türkiye

<sup>2</sup>Mechanical Engineering Department, Kocaeli University, Türkiye

\*[goksansan@gmail.com](mailto:goksansan@gmail.com)

\*[goksan.san@araymond.com](mailto:goksan.san@araymond.com)

**Abstract** – Industrial fastening systems are undergoing a profound transformation as sustainability, electrification, and advanced material technologies reshape manufacturing priorities. Conventional joining methods—such as bolts, rivets, and welding—have served reliably for decades, yet they impose significant drawbacks in modern applications, including excess weight, stress concentrations in composites, and challenges in end-of-life disassembly. These limitations conflict with emerging goals of lightweight design, recyclability, and rapid assembly, particularly in the automotive sector.

Nature provides a rich source of inspiration for overcoming these challenges. Through billions of years of evolution, biological systems have developed attachment strategies that combine strength, adaptability, and efficiency. Biomimicry, the practice of translating these natural principles into engineering solutions, offers innovative fastening concepts that minimize energy use, enable reversible connections, and support circular economy objectives. This review explores key biological models—such as hook-and-loop mechanisms, dry adhesion systems, anisotropic interlocks, and underwater chemical bonding—and examines their engineering analogues in automotive design. By integrating these biomimetic strategies, manufacturers can achieve lighter structures, reduce assembly complexity, and enhance recyclability without compromising performance. The paper concludes by highlighting the role of biomimetic fasteners as a critical enabler for sustainable mobility and next-generation electric vehicles.

**Keywords** – Biomimicry, Fasteners, Automotive Industry, Gecko Adhesion, DOPA, Design for Disassembly (DfD), Lightweighting

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## Effects of Different Heat Treatment Conditions on Microstructure and Hardness of AISI 1040 and 5140 Steels

Salih BILAL ÇETINKAL<sup>1</sup> ve Gökhan ARICI<sup>2</sup>

<sup>1</sup>Department of Metallurgical and Materials Engineering, Faculty of Technology, Selcuk University, Türkiye

[\\*arici@selcuk.edu.tr](mailto:*arici@selcuk.edu.tr)

**Abstract** –In this study, the microstructure and hardness behavior of AISI 1040 and AISI 5140 steel samples were investigated after heat treatment with austenitizing for different durations and cooling in different environments. In the study, samples were austenitized at 850°C for 1 and 5 hours, and then cooled in air, water, and ice water. Microstructure and hardness analyses were performed on the samples after heat treatment. Ferrite and pearlite phases were observed in air-cooled samples, while martensite phases were observed in water and ice water-cooled samples. The hardness of air-cooled samples was lower than that of water-cooled samples, and also lower than that of ice water-cooled samples. Cracks formed in water and ice water-cooled samples. The Cr element in the composition of AISI 5410 steel increases hardenability and increases the martensite ratio formed. This directly contributes to the increase in hardness. Consequently, it has been shown that achieving maximum hardness is not always desirable in terms of mechanical properties, and that optimum values should be determined, taking into account the risk of cracking.

**Keywords** – AISI 1040, AISI 5140, microstructure, hardness, microcrack

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## Nlp Tabanlı Kişisel Tıbbi Asistan Geliştirilmesi

Meliha ARSLAN<sup>1</sup> ve Özal YILDIRIM<sup>2</sup>

<sup>1</sup>Yazılım Mühendisliği / Fırat Üniversitesi, Türkiye

[\\*meliha.arслан1998@gmail.com](mailto:meliha.arслан1998@gmail.com)

**Özet** – Büyük dil modelleri (LLM'ler) insan benzeri dil üretimi yeteneğiyle metin çıkarımı, anlama, yorumlama ve soru cevaplama dahil olmak üzere çeşitli doğal dil işleme (NLP) görevlerinde göstermiş olduğu başarımlar neticesinde Tıp alanında giderek artan bir ilgi görmektedir. Bu çalışma, ham laboratuvar sonuçlarının otomatik analizi ve hasta dostu bir dille yorumlanması için Büyük Dil Modelleri (LLM) tabanlı entegre bir çerçeve sunmaktadır. Geliştirilen sistem, hastalar için kan tahlil sonuç raporlarının içerdiği karmaşık terminolojiyi sadeleştirir aynı zamanda hastaya özel beslenme ve yaşam tarzı önerileri sunar. PDF formatındaki kan tahlili sonuçlarından optik karakter tanıma (OCR) ve metin madenciliği teknikleri ile yapısal verileri ayıklar. Elde edilen veriler, özel olarak tasarlanmış istem (prompt) mühendisliği teknikleri kullanılarak bir LLM tarafından analiz edilir. Sonuçlar sistematik, ölçülebilir ve bilimsel bir formata uygun olarak değerlendirilmesi yapılmıştır. Çalışma sonuçları, LLM tabanlı asistanların, sağlık profesyonellerinin yerini almadan, hastaların kendi sağlık verilerini anlama kapasitelerini artırmada ve hasta-hekim iletişimini güçlendirmede etkili bir araç olabileceğini göstermektedir.

*Anahtar Kelimeler – Büyük Dil Modelleri, Optik Karakter Tanıma (OCR), Sağlık Okuryazarlığı, Prompt Mühendisliği, Laboratuvar Sonuç Analizi*

## Hygrothermal Aging Effects on Automotive Grade 3D Printed DLP Polymer Fasteners: A Material Degradation Study

Gökşan ŞAN<sup>1</sup>

<sup>1</sup>Design Center, ARaymond Türkiye, Türkiye

<sup>2</sup>Mechanical Engineering Department, Kocaeli University, Türkiye

\*[goksansan@gmail.com](mailto:goksansan@gmail.com)

\*[goksan.san@araymond.com](mailto:goksan.san@araymond.com)

**Abstract** – Additive manufacturing technologies such as Digital Light Processing (DLP) are increasingly used to produce polymer fasteners for automotive applications due to their design flexibility and rapid prototyping capabilities. However, the long-term reliability of these components under combined heat and humidity exposure remains a critical concern. This study investigates the hygrothermal aging effects on mechanical performance and material integrity of automotive-grade DLP-printed polymer fasteners. Samples were subjected to accelerated aging conditions at 85°C and 85% relative humidity for 100 hours, simulating harsh automotive environments. Mechanical tests, including insertion force and tensile pull-off strength, were performed before and after aging. Dimensional stability and surface morphology were analyzed using optical microscopy. Results indicate a 15–25% reduction in tensile strength and noticeable embrittlement in aged samples, primarily due to polymer chain degradation and moisture-induced microcracking. These findings highlight the need for material optimization and protective coatings to ensure durability of 3D-printed fasteners in automotive applications.

**Keywords** – Hygrothermal aging, DLP 3D printing, polymer fasteners, automotive applications, material degradation, tensile strength

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## Influence of Interfacial Geometry on Mechanical Retention and Flash Formation in Dual-Material Fasteners

Gökşan ŞAN<sup>1</sup>

<sup>1</sup>Design Center, ARaymond Türkiye, Türkiye

<sup>2</sup>Mechanical Engineering Department, Kocaeli University, Türkiye

\*[goksansan@gmail.com](mailto:goksansan@gmail.com)

\*[goksan.san@araymond.com](mailto:goksan.san@araymond.com)

**Abstract** – Dual-material (2K) injection molding is widely used in automotive fastener design to combine soft and rigid polymers for improved functionality. However, interfacial geometry not only affects mechanical retention but also influences flash formation in narrow flow channels during molding, which can compromise dimensional accuracy and locking performance. This study investigates the relationship between interfacial geometry and mechanical retention strength, while analyzing flash occurrence in thin-section flow regions. Fastener prototypes with varying interfacial designs (flat, dovetail) were produced using TPU–PP combinations via 2K injection molding. Pull-off tests were conducted to measure retention forces, and flash formation was quantified through optical microscopy and dimensional measurement. Moldflow was employed to simulate flow distribution and predict failure zones under injection pressure loading. Results indicate that dovetail and flat geometries improve retention by up to 35% but increase flash risk in narrow flow areas due to complex melt fronts. Optimized gating and venting strategies reduced flash occurrence without compromising adhesion. These findings provide design guidelines for balancing mechanical performance and manufacturability in multi-material fasteners for automotive applications.

**Keywords** – Dual-material fasteners, interfacial geometry, mechanical retention, flash formation, 2K injection molding, finite element analysis

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## Design Influence on IP54 Compliance of Polymer Fasteners in EV Power Distribution Units

Gökşan ŞAN<sup>1</sup>

<sup>1</sup>Design Center, ARaymond Türkiye, Türkiye

<sup>2</sup>Mechanical Engineering Department, Kocaeli University, Türkiye

\*[goksansan@gmail.com](mailto:goksansan@gmail.com)

\*[goksan.san@araymond.com](mailto:goksan.san@araymond.com)

**Abstract** – Ingress protection (IP) requirements for Electric Vehicle (EV) Power Distribution Units (PDUs) are essential to ensure reliability under exposure to dust and water splashes. Achieving IP54 compliance demands effective sealing strategies integrated into fastener design without compromising assembly performance. This study examines the impact of polymer fastener geometry and sealing features on IP54 protection levels. Three design variations—flat interface, ribbed interface, and integrated elastomer seals—were analyzed using Moldflow simulations and validated through IEC 60529 IP54 tests, including dust ingress and water spray evaluations. Mechanical retention tests were also conducted to assess assembly robustness. Results demonstrate that ribbed geometries combined with elastomer seals achieved full IP54 compliance, while flat designs without seals exhibited minor dust penetration. Simulation data correlated with experimental findings, highlighting critical leakage paths and seal compression behavior. These insights provide practical guidelines for optimizing fastener design to balance ingress protection, mechanical strength, and manufacturability in EV applications.

**Keywords** – IP54 compliance, polymer fasteners, EV power distribution, sealing performance, ingress protection, Moldflow analysis

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## The Use of Dual-Phase High-Strength (Dp) Steels (Dp800 And Dp1000) in Automotive Body Design: Comparison of Mechanical Properties and Formability

Yusuf ALPTEKİN TÜRKKAN<sup>1</sup>

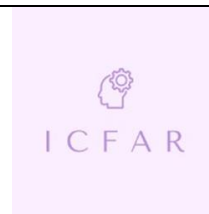
<sup>1</sup>*Elektronik Teknolojisi Programı / Orhangazi Yeniköy Asil Çelik MYO, Uludağ Üniversitesi, Bursa*

[\\*turkkan@uludag.edu.tr](mailto:*turkkan@uludag.edu.tr)

**Abstract** – The automotive industry is focused on reducing vehicle weight, aligning with its goals of improving fuel efficiency and lowering CO<sub>2</sub> emissions. In achieving this goal, Dual-Phase (DP) steels, the most common members of the High Strength Advanced Steels (AHSS) family, play a critical role in maintaining crash safety. In this study, the microstructural properties, basic mechanical performances and formability limitations of DP800 steels, which are frequently preferred in automotive structural elements, and DP1000 steels in the ultra-high strength segment were examined comparatively. While DP1000 offers a higher strength compared to DP800, allowing for thinner cross-section utilization and thus mass reduction, the negative effects of increased strength on formability and weldability have been analyzed. The study aims to guide design engineers in optimizing the balance of mechanical properties and manufacturing processes between these two materials.

*Keywords* – Dual-Phase Steel (DP Steel), DP800, DP1000, High-Strength Steel (AHSS), Automotive Structural Elements

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## Biomass Recovery by a Hydrodeoxygenation Reaction: DFT Study and Modelling

Neyla CHERIF BENMOUSSA<sup>1</sup>, Redouane BACHIR<sup>2</sup>, Roberto LINGUERRI<sup>3</sup>, Sumeya BEDRANE<sup>4</sup>,  
Wahiba BENDEDDOUCHE<sup>5</sup>, Sihem AZIZI<sup>6</sup> and Majdi HOCHLAF<sup>7</sup>

<sup>1</sup>Laboratory of Catalysis and Synthesis in Organic Chemistry, University of TLEMCEM, TLEMCEM, ALGERIA

<sup>2</sup>COSYS/IMSE, University Gustave Eiffel, Champs sur Marne, FRANCE

\*[neylacherifbenmoussa@yahoo.fr](mailto:neylacherifbenmoussa@yahoo.fr)

**Abstract** – Ecology has become for several years a main axis in scientific research. Industrial and technical progress in the development sectors increases the need to draft laws to protect the environment, this by establishing anti-pollution standards. Biomass is one of the most promising renewable energy resources offering interesting prospects since it is pollution-free, cheap and very abundant [1].

This work concerns the development of biomass by the production of molecules with higher added value. For this we have chosen two different approaches to the hydrodeoxygenation reaction [2] in order to make a comparative study between the transformation of the FAF (1,5-bis (2furanyl) -1,4-pentadien-3-one) into “one-pot »(Under high temperature and pressure) and the transformation of furfural into FAF then into alkanes according to a « Domino » reaction.

The two reactions were studied on monometallic (M / SiAl) and bimetallic (M-M' / SiAl) supported on silica-alumina (SiO<sub>2</sub> / Al<sub>2</sub>O<sub>3</sub>) by varying the metal (Ni, Cu, Ru, Pt). Our catalysts have proven to be very active, leading to a total conversion of the FAF. These reactions are being studied by DFT [3].

*Keywords* – Biomass, FAF, Catalytic Process, DFT Study, Modelling

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## Numerical Modeling and Parametric Analysis of Reinforced Concrete Corbel Strengthened with CFRP

Hiba ZAIOUNE<sup>1</sup> and Samy MEZHOUD<sup>2</sup>

<sup>1</sup>Civil Engineering / Laboratoire LMDC., University of Mentouri Brothers Constantine 1, Constantine, Algeria

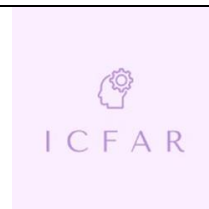
<sup>2</sup>Civil Engineering / Laboratoire LMDC., University of Mentouri Brothers Constantine 1, Constantine, Algeria

\*[hiba.zaioune@umc.edu.dz](mailto:hiba.zaioune@umc.edu.dz)

**Abstract** – This study provided a numerical investigation of the behavior of short-reinforced concrete corbels externally strengthened with carbon fiber-reinforced polymer (CFRP). Three-dimensional (3D) finite element (FE) models were created and analyzed for this purpose. The research examined the influence of a number of characteristics on the structural behavior of corbels. Included in the parameters were the influence of shear span-to-depth ratio as well as the number of layers and width of external composite strips. All corbels specimens are tested under three-point bending. According to the results, the investigated factors significantly affect corbel behavior and shear capacity. This means that increasing the width of CFRP strips from 40 mm to 100 mm improves the ultimate shear load and increases load capacity by about 99% when compared to the control sample, while increasing the ratio of the shear span to the effective depth ( $a / d$ ) from 0.69 to 1.0 causes a 57% decrease in shear capacity. The findings also showed that, compared to corbels reinforced with a single layer of CFRP strips, the number of layers of CFRP strips may improve the load-carrying capacity, resulting in an extra strength gain of 72% . The different modes of failure and crack patterns are well illustrated and discussed.

**Keywords** – Corbel, Shear span to depth, CFRF Strengthening, Shear capacity, finite element, Numerical simulation, Reinforced concrete.

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## Multicomponent, Efficient Approach for the Synthesis of Pyrazolo[3,4-D]Pyrimidine Derivatives Under Sonication

Racha AMIRA BENOUNE<sup>1</sup>, Raouf BOULCINA<sup>2</sup> and Abdelmadjid DEBACHE<sup>3</sup>

<sup>1</sup>Department of chemistry/faculty of exact science, University of frères Mentouri - Constantine 1, Algeria

<sup>2</sup>Department of chemistry / Faculty of Technologie, University of Batna 2, Algeria

<sup>3</sup>Department of chemistry/faculty of exact science, University of frères Mentouri - Constantine 1, Algeria

\*[rachamira96@gmail.com](mailto:rachamira96@gmail.com)

**Abstract** - Multicomponent reactions (MCRs) are known as a powerful tool for the construction of novel and structurally complex molecules in a single pot ensuring high atom-economy, good overall yields and high selectivity, lower costs, shorter reaction times, minimizing waste, labor, energy, and avoidance of expensive purification processes. It has been established that MCRs are generally much more environmentally friendly, and offer rapid access to large compound libraries with diverse functionalities. The main challenge facing scientists today is a pollution-free environment. Thus, synthetic organic chemists centered their attention on developing practical methods, conditions, usage of materials, and the reaction media depending on green chemistry principles.

Ultrasound irradiation has been considered as a clean and useful protocol in organic synthesis during the last three decades, compared with traditional methods, the procedure is more convenient and reactions can be carried out in higher yield, shorter reaction time and milder conditions under ultrasound irradiation.

Moreover, pyrazolo[3,4-d]pyrimidine derivatives are fused heterocyclic compounds, which are important because of their biological properties such as anti-cancer, antimicrobial, antiviral, anti-inflammatory, anti-angiogenic, anti-allergic and antileishmanial etc

*Keyword* - Green synthesis, multicomponent reactions, pyrazolopyrimidine, ultrasonic irradiation



## Study of the Finite-Mass Effects on Some Response Functions for the System of the Hadronic Gas-Quark Gluon Plasma Phases Coexisting in a Finite Volume

Rokaya DJIDA<sup>1</sup>, Amal AIT EL DJOUDI<sup>2</sup>, Hafida GHOBINI<sup>3</sup> and Houda MEBDOUA<sup>4</sup>

<sup>1</sup>Laboratoire de Physique des Particules et Physique Statistique, Ecole Normale Supérieure-Kouba, B.P. 92, 16050, Algiers, Algeria

[\\*rokaya.djida@g.ens-kouba.dz](mailto:rokaya.djida@g.ens-kouba.dz)

**Abstract** – To investigate the thermally driven QCD Deconfining Phase Transition (DPT), from a hadronic gas phase to a Quark Gluon Plasma (QGP), in a finite volume at zero chemical potential, we adopted the idea of examining thermodynamic quantities called response functions which give a concise description of the DPT. We dealt with the order parameter of the DPT, its first thermal derivative which represents the susceptibility and the second cumulant of the probability distribution representing the variance. For the study of the finite-mass effects, we illustrate the variations of the previous quantities in the case of massless particles and in the case where massive particles are included. These mean values are calculated using the QGP color-singlet partition function obtained within the projection method. The such obtained results are translated into graphs, with varying temperature and for different volumes of the mixed system. We notice, in addition to the similarity between the behavior of the thermal susceptibility and the behavior of the second cumulant of the probability distribution representing the variance, that the transition temperature is lowered in the case of considering massive particles in the system.

*Keywords* – Deconfinement, phase transition in QCD, color singletness, response functions

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## Influence of Temperature in Biodiesel Production with Homogeneous Catalysis

Abdelhalim BALOULI<sup>1</sup>, Tarek BERRAMA<sup>2</sup> and Hayet TIZI<sup>3</sup>

<sup>1</sup>Laboratory of Industrial Process Sciences, University of Sciences and Technology Houari Boumediene, Algeria

[\\*abdelhalim.balouli@gmail.com](mailto:abdelhalim.balouli@gmail.com)

**Abstract** – In the aim to diversify energy sources and reduce dependence on fossil fuels, research and studies are increasingly directed towards renewable energy sources, among them, biodiesel, an ecological source with great prospects for the future. Biodiesel is essentially obtained by the transesterification reaction of vegetable oils or animal grease, with a low molecular weight alcohol in the presence of a catalyst.

In our study, a waste cooking oil (soybean) is used, which reacts with methanol in the presence of potassium hydroxide as a basic catalyst, the catalysis is homogeneous. The influence of the variation of temperature (between 50 to 70°C) is investigated while the other parameters are unchanged (time of reaction duration, molar ratio and catalyst mass concentration).

The obtained results and analysis of the product show a yield of biodiesel that exceeds 90% with a density of  $d=0.882$ , a kinematic viscosity of 5.58cSt these properties show that the biodiesel obtained complies with international standards, similar to those of petrodiesel, which shows the possibility of substitution of this fossil energy source by another renewable.

*Keywords* – Biodiesel, Transesterification, homogeneous catalysis, WCO, temperature influence

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## First Principles Predictions of Structural, Electronic and Thermoelectric Properties of Half Heusler Compound CrCaSn

M. MATOUGUI<sup>1</sup>, B. BOUADJEMI<sup>2</sup>, M.A.KADAOU<sup>3</sup>, S. CHERID<sup>4</sup>, M. HOUARI<sup>5</sup>, A. ZITOUNI<sup>6</sup>, T. LANTRI<sup>7</sup> and S. HAID<sup>8</sup>

<sup>1</sup>Laboratory of Technology and of Solids Properties, Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria

<sup>2</sup>Laboratory of Quantum Physics of Matter and Mathematical Modeling (LPQ3M), MustaphaStambouli University of Mascara 29000, Algeria

<sup>3</sup>Instate of Sciences and Technology, Tissemsilt University, 38004, Algeria.

<sup>4</sup>Laboratoire CaSiCCE, B.P. 1523 El M'Naouar 31000, ENP- Maurice Audin Oran, Algeria

\*[matouguimohamed@hotmail.com](mailto:matouguimohamed@hotmail.com)

**Abstract** - We have studied and carried out a theoretical calculation using the full-potential linearized augmented plane-wave method (FP-LAPW), based on density functional theory (DFT), and implemented in the wien2k program to investigate the structural, electronic and thermoelectric properties of half Heusler alloy CrCaSn, in addition, the exchange and correlation potential is treated by different approximations: GGA-PBE and mBJ-GGA. The obtained results show that this compound has a half-metallic character (metallic nature in spin up channel and semiconductor one in spin down channel with an indirect gap), on the other hand, the compound is a good candidate for spintronic applications, moreover, it shows a very interesting thermoelectric predispositions in the minority spin or spin down channel at room temperature consisting of a very high Seebeck coefficient, high electrical conductivity and figure of merit near unity for this material. The very important value of the merit factor (ZT) and Seebeck coefficient(S) make it a promising candidate for thermoelectric applications.

*Keywords* - Half Heusler, half metallic, Seebeck coefficient, figure of merit, indirect band gap



## Lorawan Technologies for Smart City Applications: Coverage Evaluation and Comparison for the 433mhz and 833mhz Frequency Bands

A. KARKOURI<sup>1</sup>, N. Ben ACHHAB<sup>2</sup>, N. RAISSOUNI<sup>3</sup> and A. CHAHBOUN<sup>4</sup>

<sup>1</sup>Remote Sensing & Geographic Information System Unit (RS&GIS), Abdelmalek Essaadi University, Tetouan, Morocco

<sup>2</sup>Mathematics and Intelligent Systems (MASI), Abdelmalek Essaadi University, Tangier, Morocco

<sup>3</sup>Remote Sensing, Systems and Telecommunications (TST), Abdelmalek Essaadi University, Tetouan, Morocco

[\\*karkouri@gmail.com](mailto:*karkouri@gmail.com)

**Abstract** – Large scale LoRawan networks are being more and more required for the smart cities applications, however the deployment of such network supporting a wide area coverage requires a high number of LoRawan transmitters and receivers to be installed. In order to make an efficient network construction, a prior planning need to be done for different LoRawan parameters and specially the frequency band which is a main parameter for a radio frequency transmission. As LoRawan can be used under different frequencies 433 MHz and 868 MHz, we conduct a field measurement campaign using LoRawan set of transmitters and receivers under the two frequencies scenarios 433 MHz and 868 MHz. During our tests, the other parameters are maintained fixed to evaluate only the frequency band impact. The measures are focused on the evaluation of the coverage level (Received signal level) and the cell radius range. The Results show an average difference of 6.5dB on the received signal level for the 433 MHz band better than 868 MHz band. For the result's application and considering the LoRawan transmitter as an Omni cell, the coverage area of 433MHz band LoRawan cell is 25% larger than that's of 868 MHz band LoRawan cell.

*Keywords* – LoRawan transmitters and receivers, smart city, coverage, LoRawan measurements

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## Perforated Baffles in Solar Air Collector

Mustapha HENAOU<sup>1</sup> and Khaled ALIANE<sup>2</sup>

<sup>1</sup>Department of Mechanical Engineering, laboratory MECACOMP

<sup>2</sup>University of Tlemcen, Algeria

\*[mus196510@live.fr](mailto:mus196510@live.fr)

**Abstract**— The amelioration of performance of the solar collectors is to limit heat loss. This article presents a study of an air solar collector with perforated baffles. The use of a numerical study of the dynamic and thermal stationary air flow. The problem was numerically studied using finite volume method and the software Fluent solver. The results are presented in terms of the contour of streamlines, pressure coefficient and the plot of temperature distribution in the outlet of the duct.

*Keywords - Solar collector, perforated baffles, K-epsilon model, Finite volume method*

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## Two-Phase Flow in a Venturi Flow-Meter, a Hydrodynamic Experimental Study

Ammar ZEGHLOUL<sup>1</sup>, Lyes Nasser<sup>2</sup> and Zouhira HIRECHE<sup>3</sup>

<sup>1</sup>Laboratory of Multiphase Flows and Porous Media, University of Sciences and Technology Houari Boumediene, FGMGP,  
BP 32 El Alia 16111 Bab Ezzouar, Algiers,

<sup>2</sup>National Polytechnic School, BP 182, El Harrach, 16200, Algiers, Algeria.

[\\*ammar.zeghloul@g.enp.edu.dz](mailto:ammar.zeghloul@g.enp.edu.dz)

**Abstract** – This paper highlights the measurement results of air-water two-phase flow by means of a Venturi meter. The presented device can be applied within a continuous and accurate measurement of the gas-liquid mass flow rate with no need for a phase separator. The effect of the Venturi geometry on the flow behaviour was evaluated by using three different Venturis with inlet to throat diameter ratios of 0.40, 0.55 and 0.75, respectively, placed in a vertical air-water test section. The void fraction time series were measured along the test section by nine different electrical conductance sensors covering the converging, throat and diverging sections. The void fraction measurement along the Venturi (before, at the throat, and after) showed that the void fraction after the Venturi throat with a bigger diameter ratio appears to quickly restore itself when compared to that of a lower diameter ratio. It is further found that the void fraction oscillation for all Venturi diameter ratios was uniquely located in the 10D area prior to and after the Venturi throat. The comparison of the experimental data with the two-phase mass flow rate models from the literature shows that the correlation given by Chisholm with a Venturi diameter ratio  $\beta=0.55$ , present the best accuracy among other correlations.

*Keywords* - Gas-liquid flow, Venturi tube, Pressure drop, Electrical conductance probe

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## Large Scale Smart City Planning Based Lorawan: Propagation in Situ Measurement and Two Models Comparison

A. KARKOURI<sup>1</sup>, N. Ben ACHHAB<sup>2</sup>, N. RAISSOUNI<sup>3</sup>, and A. CHAHBOUN<sup>4</sup>

<sup>1</sup>Remote Sensing & Geographic Information System Unit (RS&GIS), Abdelmalek Essaadi University, Tetouan, Morocco

<sup>2</sup>Mathematics and Intelligent Systems (MASI), Abdelmalek Essaadi University, Tangier, Morocco

<sup>3</sup>Remote Sensing, Systems and Telecommunications (TST), Abdelmalek Essaadi University, Tetouan, Morocco

[\\*karkouri@gmail.com](mailto:*karkouri@gmail.com)

**Abstract** – In the radio frequency wireless communication, the control of air interface signal is a key aspect to ensure the system reliability. LoRawan as an IoT technology has taken many aspects from the preceding wireless technologies, one of those aspects is the propagation model. In fact the propagation model is very important to be able to plan accurately and efficiently the needed receivers and transmitters' location and quantity, a more accurate planning will results on more efficient, in term of construction time and also cost, and more reliable LoRawan network. We choose to work on two of main and widely used propagation models: okumura and cost-hata. To be able to judge the simulation results of each propagation model applied to a LoRawan network, we compared the calculation results to the real measurement. In fact we have done tests under different radio environments and calculate for each test the pathloss based on received level and also based on each propagation model simulation formula. From the campaign results, the path loss calculation is obviously more accurate to field results for the cost-Hata model, but we need to notice that for both models okumura and cost-hata, there is some abnormal values especially for the distances below 40m between transmitter and receiver.

*Keywords* – LoRawan, propagation, smart city, coverage, LoRawan measurements

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## Measurement Based Evaluation for the Packet Delivery Success Rate for Different LoRawan Coverage Levels

A. KARKOURI<sup>1</sup>, N. Ben ACHHAB<sup>2</sup>, A. CHAHBOUN<sup>3</sup>, and N. RAISSOUNI<sup>4</sup>

<sup>1</sup>Remote Sensing & Geographic Information System Unit (RS&GIS), Abdelmalek Essaadi University, Tetouan, Morocco

<sup>2</sup>Mathematics and Intelligent Systems (MASI), Abdelmalek Essaadi University, Tangier, Morocco

<sup>3</sup>Remote Sensing, Systems and Telecommunications (TST), Abdelmalek Essaadi University, Tetouan, Morocco

[\\*karkouri@gmail.com](mailto:*karkouri@gmail.com)

**Abstract** –LoRawan as an IoT technology is used to transmit data collected from different machines sensors or other inputs to a remote server through a gateway. More and more applications and scenarios are now using this IoT technology to deliver important information that are necessary for subsequent decisions, the accuracy and robustness of data must be ensured to have a fluent system interaction. The quality of service provided by this transmission way need to be ensured and maintained. In this paper we make a study about the packet delivery success rate for LoRawan network transmission under different coverage levels. During the tests, data packets are sent from a LoRawan transmitter under different coverage levels and different distance ranges, those packets are checked on the reception (LoRawan receiver). The comparison between sent and received packet will allow us calculate the packet delivery success rate. Our test results shows excellent results of 100% packet delivery success rate until a signal coverage level of -110dBm, from this coverage threshold the packet delivery rate will be impacted and reduced to 83% on -111dBm, 33% on -112dBm, 28% on -113% and a 0% success rate for coverage worse than -114dBm. Through the result we conclude that the LoRawan coverage planning and maintenance should keep everywhere a signal coverage level better than -110dBm.

*Keywords* – LoRawan, quality of service, smart city, coverage measurements

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## **Buckling Analysis of Nanocomposite Beams Based on Refined Beam Theory by Considering the Agglomeration Effect of Cnts**

Ihab EDDINE HOUALEF<sup>1</sup>, Ismail BENSAID<sup>2</sup> and Ahmed SAIMI<sup>3</sup>

<sup>1</sup>Mechanical engineering Department, Faculty of Technology, IS2M Laboratory,  
University of Abou Beckr Belkaid (UABT), Tlemcen, Algeria\*

<sup>2</sup>Mechanical engineering Department, University of Abou Beckr Belkaid (UABT), Tlemcen, Algeria

<sup>3</sup>Mechanical engineering Department, Faculty of Technology, IS2M Laboratory,  
University of Abou Beckr Belkaid (UABT), Tlemcen, Algeria

[\\*ihabihabeddine1@gmail.com](mailto:ihabihabeddine1@gmail.com)

**Abstract** – The present work deals with buckling load behavior of nanocomposite beams by considering the agglomeration effect of single-walled carbon nanotubes (CNTs) and different patterns CNTs in polymeric matrix. The material properties of nanocomposite beams are estimated using the Eshelby–Mori–Tanaka approach based on an equivalent fiber. The equations of motion are derived based on refined beam strain gradient theory, employing Hamilton’s principle and using Differential Quadrature Finite Element Method (DQFEM) derived from the differential quadrature method (DQM). The results are compared with analytical results in the literature. It is remarked that mechanical properties and therefore critical buckling loads of nanocomposite beam are seriously affected by CNTs agglomeration.

**Keywords** – DQFEM, Buckling, CNTs, Agglomeration effect of CNT, refined higher-order beam theory

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## Lorawan Technology for Smart City: Speed Impact on the Packet Delivery Success Rate

A. KARKOURI<sup>1</sup>, N. Ben ACHHAB<sup>2</sup>, A. CHAHBOUN<sup>3</sup>, and N. RAISSOUNI<sup>4</sup>

<sup>1</sup>Remote Sensing & Geographic Information System Unit (RS&GIS), Abdelmalek Essaadi University, Tetouan, Morocco

<sup>2</sup>Mathematics and Intelligent Systems (MASI), Abdelmalek Essaadi University, Tangier, Morocco

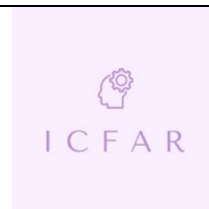
<sup>3</sup>Remote Sensing, Systems and Telecommunications (TST), Abdelmalek Essaadi University, Tetouan, Morocco

[\\*karkouri@gmail.com](mailto:*karkouri@gmail.com)

**Abstract** – Smart city application and scenarios are becoming nowadays more diversified. Some of those scenario involve a usage of moving transmitter or receiver. As known on other wireless technologies the speed can be an impacting element on the quality of service. Since the accuracy of data should be maintained, it's important to consider on the prior planning all the impacting aspects for the propagation and quality of service. This study will evaluate the speed's impact on the packet delivery success rate for a LoRawan network by conducting a test campaign using first a moving transmitter and secondly a moving receiver. The packets sent from the transmitter will be checked and compared to those got on the receiver to calculate the packet delivery success rate. The results shows for a moving receiver; for a speed between 3kmph and 81Kmph; that the speed is not impacting the packet delivery rate and keeping as 100% since the receive signal level is within normal range better than -110dBm. On the second scenario with moving transmitter the results keep similar without impact of the speed on packet delivery success rate for a speed from 3kmph to 60Kmph.

*Keywords* – LoRawan, quality of service, smart city, Packet delivery rate

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## Preparation and Characterization of PVA/Bentonite Film for Adsorption Applications

Belkhodja ABDELMAJID<sup>1</sup>, Belhocine RYAD<sup>2</sup>, Abbou IMANE<sup>3</sup>, Guendouz SOUHEYLA<sup>4</sup>, Benkhaled AMEL<sup>5</sup> and Choukchou-Braham ESMA<sup>6</sup>

<sup>1</sup>Laboratoire de Recherche Toxicomed, Université Abou Baker Belkaid, BP119, 13000 Tlemcen, Algérie

[\\*majid92t@hotmail.com](mailto:*majid92t@hotmail.com)

**Abstract** – The elaboration of films based on natural materials is the research of actuality, which is done by a simple method, consisting of the combination of an amount of polymer with a raw material like clay. These films have multiple applications. In this study, several films were prepared on the basis of a biodegradable polymer polyvinyl alcohol (PVA), and clays bentonite from the west of Algeria. The three PVA / Bentonite based films were prepared by fixing the polymer at 10% and varying the bentonite as follows: 1, 3, and 5% and the named prepared films are FB1, FB2, and FB3 respectively. Infrared characterization of bentonite shows the presence of specific bands characterizing each material. The DRX analysis of the PVA / Bentonite films shows the disappearance of the montmorillonite peak in the films FB1 (PVA 10%/Bentonite 1%) and FB2 (PVA 10% /Bentonite 3%), this means an exfoliation of clay, which explains the excellent quality of the elaborated films. In the film FB3 (PVA 10% /Bentonite 5%) an increase of the montmorillonite interleaved space from 3 Å to 23 Å can be explained by clay intercalation. The adsorption tests of PVA/bentonite films on lead gave acceptable results, and the best retention obtained from the FB1 film is about 37.49%.

**Keywords** – Film, Bentonite, PVA, Adsorption, Lead

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## Evaluation of Adhesion and Moisture Susceptibility of Cotton Stalk Modified Bitumen

Adeel IQBAL<sup>1</sup>, Sajjad AHMAD<sup>2</sup>, Hafiz AMMAR ZAHID<sup>3</sup>, Abid LATIF<sup>4</sup> and Muhammad ZAHID<sup>5</sup>

<sup>1</sup>Department of Civil Engineering, Bahauddin Zakariya University, Multan, Pakistan

<sup>2</sup>Department of Civil Engineering, University of Engineering and Technology, Taxila, Pakistan

\*[chadeel6657@gmail.com](mailto:chadeel6657@gmail.com)

**Abstract** – Worldwide, the improper disposal of agricultural waste poses a major threat to the environment. One of the primary topics of modern research in pavement engineering is the environmentally sustainable disposal of waste by utilizing it as a modifier in bitumen. It has been discovered that biochar, which is made from a variety of agricultural wastes, can be used to alter or partially replace the traditional bitumen. Using Cotton Stalk (CS) waste to create biochar for utilization in bitumen can enhance the characteristics of the binder while helping to mitigate the environmental issues. In this study, CS biochar modified binder at weight percentages of 2%, 4%, 6%, and 8% has been investigated to evaluate the effects on the characteristics of the control binder. In addition to the standard binder tests, the bitumen bond strength test and the rolling bottle test are performed to determine the modified binder adhesion and moisture susceptibility. Based on the findings of this research, a biochar-modified binder with a weight percentage of 8% of the total binder content exhibited the best adhesion and moisture susceptibility. There was a noticeable performance increase when biochar and bitumen were mixed together in an optimal manner. Biochar's potential to reduce environmental effects and improve bitumen's performance makes it an attractive option for binder modification in the pavement sector in subtropical and tropical areas.

**Keywords** – Bitumen, Agriculture waste, Cotton Stalk, Biochar, Bitumen Bond Strength

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## Concentrate on Solar Gains to Improve the Thermal and Energy Efficiency of a Primary School Exposed to the Mediterranean Climate

Salah-Eddine JAOUAF<sup>1</sup> and Bourassia BENSAAD<sup>2</sup>

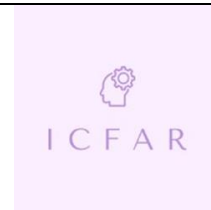
<sup>1</sup>Mechanical Engineering Department, Smart Structure Laboratory, University of Ain-Temouchent, 46000 Ain-Temouchent, Algeria.

[\\*jaouaf.salah@gmail.com](mailto:jaouaf.salah@gmail.com)

**Abstract** – The building sector accounts for 30% to 40% of annual global energy consumption, and this percentage keeps on increasing with the needs and demands of humans. The building envelope it's a crucial factor to reduce the building energy demand, especially in heating-dominated climates. Hence the need to choose the appropriate construction materials is more important because of the desire of the inhabitants to ensure thermal comfort. This theoretical work focuses on the thermal aspect of the design of the building envelope and the type of glazing to determine the best configuration for the energy efficiency of the building of a primary school located in the city of Ain Temouchent (Algeria). By studying and analysing the nine configurations we applied in the building envelope in terms of energy and thermal comfort. The numerical simulations were implemented using the TRNSYS thermodynamic simulation program. The results show the second case is the best solution in terms of consumption. Moreover, it is the simplest and the cheapest. But using the eighth case with some modifications might be better.

**Keywords** – Energy efficiency, energy consumption, heat transfer, indoor thermal comfort, TRNSYS

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## A First Order Differential Equation Involving the Riemann-Liouville Derivative of Linear Variable Order

Hallouz ABDELHAMID<sup>1</sup> and Souid MOHAMMED SAID<sup>2</sup>

<sup>1</sup>Department of Mathematics, Faculty of Mathematics and Computer Sciences Ibn-Khaldoun University, Tiaret, Algeria

<sup>2</sup>Department of Economic Sciences, University of Tiaret, Algeria

[\\*abdelhamid\\_elpt@yahoo.com](mailto:abdelhamid_elpt@yahoo.com)

**Abstract** – In this work, we shown the existence of solutions for a first v having a singular differential equation of variable order. We use some analysis techniques and the Arzela-Ascoli theorem, and then illustrate our results with exemples.

**Keywords** – fractional differential equations of variable order, boundary value problem, fixed point theorem

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## Genetic Algorithm Based Feature Extraction for Medical Image Classification

Fella BERRIMI<sup>1</sup>, Riadh HEDLI<sup>2</sup> and Chafia KARA-MAHAMED<sup>3</sup>

<sup>1</sup>LRSD Laboratory, Faculty of Sciences, Ferhat Abbas University, Algeria

<sup>2</sup>LMFN Laboratory, Faculty of Sciences, Ferhat Abbas University, Algeria

[\\*fellaber@yahoo.fr](mailto:fellaber@yahoo.fr)

**Abstract** –The goal of this work is to create a system for retrieving medical images that can analyze this type of image effectively. This system includes three phases. In first phase, we use genetic algorithm to select optimal subset of feature that contains the utile information. In second ones, we use three algorithms to extract the main features from the subset identified by genetic algorithm through the precedent phase. These algorithms are: histogram based oriented gradient, shift invariant feature transformation algorithm and Gabor transformation. In the third phase to classify the feature vector and determine the appropriate image, Support Vector Machine (SVM) classifier is used. The experimental results demonstrate the system's generality and ability to generate various types of medical image and show that the genetic algorithm selects optimal subset of feature to identify the right set of images.

*Keywords* – genetic algorithm, feature extraction, medical image, SVM

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## Study And Analysis of the Influence of the Grading Ring on the Performance of a Composite Insulator Using the Response Surface Methodology

Khaled BELHOUCHE<sup>1</sup> and Abderrahim ZEMMIT<sup>2</sup>

<sup>1</sup>Department of Electrical Engineering, Faculty of Technology, Mohamed Boudiaf University, M'sila 28000, Algeria.

\*[khaled.belhouchet@univ-msila.dz](mailto:khaled.belhouchet@univ-msila.dz)

**Abstract** – This paper reports on a new approach to analyze the effect of grading ring on the stress of the electric field along a composite insulator. Finite element method combined with the experimental design methodology were used in order to minimize the maximum E-field along the insulator length, with the objective of increasing its long-term performance. The analysis of variance (AVOVA) is used to evaluate the main effects and the interaction effects of three studied parameters; position of the ring from the end, radius of the ring and thickness of the tube of the ring. The relationship between the field E and the geometric parameters is optimized and modeled by the response surface methodology (RSM). The results show a great optimization of the E- fields, and a uniform distribution of the electric potential along the insulator was noted. The results show that use of the optimized grading ring -on transmission line composite insulators- and it presents more accurate result in finding the best solutions for corona discharges problems.

**Keywords** – Composite insulator, grading ring, Electric field, Finite element method, response surface methodology

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## Effect of TiO<sub>2</sub> Coatings on the Electric Field Distribution of Outdoor High-Voltage Porcelain Insulators Using AFM and FEM

Khaled BELHOUCHE<sup>1</sup> and Abderrahim ZEMMIT<sup>2</sup>

<sup>1</sup>Department of Electrical Engineering, Faculty of Technology, Mohamed Boudiaf University, M'sila 28000, Algeria.

\*[khaled.belhouchet@univ-msila.dz](mailto:khaled.belhouchet@univ-msila.dz)

**Abstract** – Porcelain insulators used in power transmission lines were coated with TiO<sub>2</sub> films with the aim of improving its performance. Surface characterization of insulators before and after field exposition was performed by Micro-Raman Spectroscopy. The roughness was measured using AFM. To study the effect of coating on electric field distribution, simulations were carried out using Comsol Multiphysics. Electric field and potential simulations were carried out for two different cases; with coating and without coating. It was also observed during simulations that electric field stress decreases with application of coating, thus TiO<sub>2</sub> shows a good efficiency when it is applied to porcelain insulators.

**Keywords** – Surface, AFM, TiO<sub>2</sub>, Flashover, Leakage current, FEM

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## Adsorption of Methylene Blue in Water on Magnetic Bentonite/Calcium Alginate Beads: Contact Time and Effect of Initial Pollutant Concentration

Abd ERRAHMANE ZEMOURI<sup>1</sup> and Embarek BENTOUHAMI<sup>2</sup>

<sup>1</sup>Process Engineering Department / Chemical Process Engineering Laboratory, Ferhat Abbas University Setif-1, Algeria

<sup>2</sup>Process Engineering Department / Molecular Engineering Chemistry and Nanostructures Laboratory, Ferhat Abbas University Setif-1, Algeria

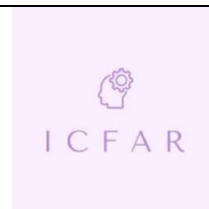
[\\*zemabderrahmane2@gmail.com](mailto:*zemabderrahmane2@gmail.com)

**Abstract** – Pollutants including pesticides, hazardous compounds, and toxic dyes are released into the environment as a result of industrial activities. The most hazardous textile dye is methylene blue (MB). They have been researched for a variety of industrial processes, mainly to increase adsorption capacity or decrease preparation costs. Recent research has focused on mixing these adsorbents to create multifunctional composite materials. Particularly for use in magnetic separation, magnetic adsorbents are now being developed.

In this work, magnetic bentonite/calcium alginate beads were synthesized. The adsorption kinetics of MB dye by the nanocomposite beads was evaluated. Pseudo-first order and pseudo-second order were applied to investigate the adsorption mechanism. The results show that the adsorption kinetics of MB follows a pseudo-second-order model. The effect of initial pollutant concentration on the adsorption of methylene blue on magnetic bentonite beads was studied. The retention capacity of methylene blue was represented for different initial pollutant concentrations ranging from  $C_0 = 150$  mg/L to  $C_0 = 250$  mg/L. The results show that the amount adsorbed increases with the increase of the initial pollutant concentration.

*Keywords* – Bentonite, magnetic, methylene blue, adsorption, beads

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## Methylene Blue Removal by Magnetic Organophilic Bentonite: Effect of Ph and Initial Concentration

Abd ERRAHMANE ZEMOURI<sup>1</sup> and Embarek BENTOUHAMI<sup>2</sup>

<sup>1</sup>Process Engineering Department / Chemical Process Engineering Laboratory, Ferhat Abbas University Setif-1, Algeria

<sup>2</sup>Process Engineering Department / Molecular Engineering Chemistry and Nanostructures Laboratory, Ferhat Abbas University Setif-1, Algeria

\*[zemabderrahmane2@gmail.com](mailto:zemabderrahmane2@gmail.com)

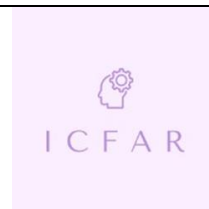
**Abstract** – A lack of clean water for daily usage is brought on by the rapid rise of the population and industrial developments. Organic water contaminants are of main concern because they are mutagenic and carcinogenic, which have negative impacts on biota. Among the key contaminants to be eliminated are dyes and medicines.

The majority of dyes are not biodegradable, and many of them have mutagenic and carcinogenic effects. One of the riskiest dyes used in the textile industry is methylene blue (MB). For the treatment of wastewater, various technologies have been developed. These procedures benefit from adsorption because it leaves no chemical residue, can handle contaminants at low concentrations, is inexpensive, and can be recycled. magnetic nanoparticles have recently made significant progress in their ability to remove harmful dyes from wastewater.

In this work, magnetic organophilic bentonite was synthesized. The effect of pH variation from 2 to 12 and the initial pollutant concentration were studied. The retention capacity of methylene blue was represented for different initial pollutant concentrations ranging from  $C_0 = 50$  mg/L to  $C_0 = 150$  mg/L. The results show that the amount adsorbed increases with the increase of the initial pollutant concentration.

*Keywords* – Bentonite, magnetic, methylene blue, Organophilic, beads

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## Study of Adsorption Properties of Dyes on Magnetic Organophilic Bentonite and Magnetic Organophilic Bentonite Beads

Abd ERRAHMANE ZEMOURI<sup>1</sup> and Embarek BENTOUHAMI<sup>2</sup>

<sup>1</sup>Process Engineering Department / Chemical Process Engineering Laboratory, Ferhat Abbas University Setif-1, Algeria

<sup>2</sup>Process Engineering Department / Molecular Engineering Chemistry and Nanostructures Laboratory, Ferhat Abbas University Setif-1, Algeria

\*[zemabderrahmane2@gmail.com](mailto:zemabderrahmane2@gmail.com)

**Abstract** – Water quality generally deteriorates due to the proliferation of contaminants such as pesticides, dyes, and heavy metals. The majority of dyes are not biodegradable, and many are believed to have mutagenic and carcinogenic effects. Methylene blue (MB) is one of the most dangerous dyes used in the textile industry.

Adsorption of dyes on various adsorbent surfaces is considered a promising method to remove dyes from effluents because it is inexpensive, easy to use, and insensitive to toxic pollutants. Recent advances in the field of magnetic nanoparticles have been widely developed to remove toxic dyes from wastewater due to their microscopic particles, high magnetism, and ease of separation.

In this study, magnetic organophilic bentonite was synthesized and then encapsulated to form magnetic organophilic bentonite beads. The adsorption isotherms of MB dye by the nanocomposites were evaluated. Langmuir and Freundlich models were applied to evaluate the adsorption properties of the dye on the nanocomposites.

We can immediately conclude that the magnetic organophilic bentonite beads are efficient in the adsorption process, are regenerable, and are easily separated from the solution depending on the proportion taken in the MB.

*Keywords* – Bentonite organophilic, Magnetic, Beads, Methylene blue, Adsorption

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## Photodegradation of an Antibiotic in the Presence of a Semiconductor: Titanium Dioxide (TiO<sub>2</sub>)

Abd ERRAHMANE ZEMOURI<sup>1</sup> and Embarek BENTOUHAMI<sup>2</sup>

<sup>1</sup>Process Engineering Department / Chemical Process Engineering Laboratory, Ferhat Abbas University Setif-1, Algeria

<sup>2</sup>Process Engineering Department / Molecular Engineering Chemistry and Nanostructures Laboratory, Ferhat Abbas University Setif-1, Algeria

\*[zemabderrahmane2@gmail.com](mailto:zemabderrahmane2@gmail.com)

**Abstract** – Water purification is a serious problem, especially with the unprecedented growth of pollutants from the pharmaceutical industries. Antibiotics are one of the pharmaceutical pollutants found in domestic and hospital wastewater and are suspected to affect the balance of ecosystems and human health, even at low concentrations.

Heterogeneous photocatalysis is a phenomenon in which the catalyst initiates a chemical reaction through the action of solar energy. (in the presence of a photocatalyst, light, or water). This process is based on the generation of the hydroxyl radical OH•, which turns out to be a powerful oxidant able to convert organic substances into harmless compounds such as carbon dioxide or water.

The objective of our work was therefore to elucidate the degradation process of an antibiotic during its exposure to light.

This study was carried out according to the variations of physicochemical parameters, such as the initial concentration of the pollutant, the quantity of catalyst, the pH of the solution and the addition of oxidants. The results of the studies conducted indicate that advanced oxidation processes (AOP) are effective in treating streams contaminated with pharmaceuticals.

*Keywords* – Photocatalysis, Degradation, Antibiotic, Water treatment, Hydroxyl radicals

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## Effect of Transition Metals on Electrical Properties of Zinc Phosphate Glass: DFT Study

Maghni CHERIF<sup>1</sup> and Kharroubi MOHAMED<sup>2</sup>

<sup>1</sup>Physico-chemistry of Materials and Environment Laboratory, ZianeAchour University of Djelfa, BP 3117, Djelfa, Algeria

<sup>2</sup>Université Mohammed chérif messaadia BP 1553 Souk Ahras 41000, Algérie

<sup>3</sup>Department of Physics, Faculty of Science, Med Boudiaf University-M'Sila, Bp 166, 28000 M'sila, Algeria

[\\*c.maghni@univ-soukahras.dz](mailto:c.maghni@univ-soukahras.dz)

**Abstract** – Glasses doped with transition metals ions are the subject of a great interest and have given rise to much research these recent years, due to their possible applications such as; lasers, photoconductive devices, magnetic materials, phosphors, Cathode materials for batteries, optical fiber communication devices, etc. These ions are also of great fundamental interest, as their properties derive from their interaction with the surrounding material. This work deals with the ionic conduction mechanism in  $\text{Na}_2\text{Zn}_{(1-x)}\text{M}_x\text{P}_2\text{O}_7$  (M:  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$ , and  $\text{Cu}^{2+}$ ) type phosphate glasses. A theoretical model is used in order to find the experimental results and to draw some parameters to which we can give a physical significance. The application of the DFT method obviously cannot lead to a quantitative evaluation of the considered energies. It does, however, make it possible to qualitatively find behaviors that can help distinguish the nature of the preponderant interactions that are established between the glassy network and the cation during the hop process.

**Keywords** –Phosphate glass, DFT, conductivity, transition metals, complex impedance spectroscopy

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## Brain Tumor Segmentation Using Advance Medical Imaging Technique

Syed MUDDUSIR HUSSAIN<sup>1</sup>, Tayaba NAZ<sup>2</sup> and Faraz AKRAM<sup>3</sup>

<sup>1</sup>Biomedical, Riphah International University, Pakistan

<sup>2</sup> Biomedical, Foundation University School of Science & Technology, Pakistan

<sup>3</sup>Biomedical, Riphah International University, Pakistan

[\\*muddasir\\_right@hotmail.com](mailto:muddasir_right@hotmail.com)

**Abstract** –The brain is a vital and complex organ of the human system. It is responsible for controlling the overall activity of the human body. Normal functionality of the organs depends on the healthy brain and any disorder in the brain may cause a critical and life-threatening condition. There are several disorders related to the brain like Alzheimer, Tumor, Cancer, Epilepsy, and Stroke. The severity of the brain disorder depends on the region and its intensity. Among all these disorder brain Tumors is the most common which may occur in any age and gender. There are several modalities used to acquire the image of the brain to diagnose a brain tumor, but identifying the tumor from the image requires profound knowledge and expertise. Physically identification of the tumor from the radiologic image is a common practice of medical professionals; however, the procedure has the probability of human error. Computer-aided diagnoses of Brain Tumors assist the medical professional to estimate the proper region of the tumor in an image in a better way. Several approaches have been adopted by the researcher to identify the brain tumor from a radiologic image. This article proposed a MATLAB-based graphical user interface to assist medical professionals to estimate Brain Tumors from radiologic Images. The algorithm is based on the acquisition of the radiological image, preprocessing, Image segmentation, and algorithm implementation for Tumor detection. Significant results have been achieved via the proposed algorithm. The algorithm reduces the process time and rate of human error cost-effectively.

**Keywords** – Brain Tumor Detection, Brain Tumor Segmentation, Tumor Segmentation using MATLAB, Tumor Detection, Image Processing

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## Android Based Wearable Device for Real Time Continuous ECG Monitoring Via ESP-32

Tayaba NAZ<sup>1</sup>, Syed MUDDUSIR HUSSAIN<sup>2</sup> and Faraz AKRAM<sup>3</sup>

<sup>1</sup>Biomedical, Foundation University School of Science & Technology, Pakistan

<sup>2</sup> Biomedical, Riphah International University, Pakistan

<sup>3</sup>Biomedical, Riphah International University, Pakistan

[\\*tayaba.naz31@hotmail.com](mailto:*tayaba.naz31@hotmail.com)

**Abstract** – The heart is a vital organ that pumps blood to organs, and tissues to all parts of the body. It supplies oxygenated blood and nutrients throughout body tissue. The rhythmic activity of the heart is produced by the generation of the electrical signal to the Sinus node. The electrical signal propagates through the conduction channels of the heart to contract the cardiac muscle. The proper rhythm of muscle contraction and relaxation indicates the normal function of cardiac activity. The Electrocardiogram (ECG) is a vital signal that has to be monitored to analyze the function of the heart. Several non-invasive techniques and devices are used to acquire and monitor heart activity. The device size and power consumption are the challenges to portably monitoring the real-time ECG continuously. Small-size Microcontrollers are extensively used in the Medical industry to acquire and monitoring of Physiological signals. The small size and low power consumption ability of the Microcontroller support the medical industry to design and developing a portable wearable to acquire continuous Real-time Physiological signals. The main idea of the research is to design a portable ECG monitoring wearable that can monitor the real-time ECG of the person during daily routine activity. The ECG is acquired via ADS 8232 ECG module that is specially designed to acquire and filter the ECG signal. ESP-32 Microcontroller are used to process and send data through a built-in Bluetooth module to Android Application as well as OLED Module to display real-time ECG The device is powered by a chargeable 3.3 volts Lithium battery.

**Keywords** – Real-time ECG, ESP-32 ECG, Continuous ECG monitoring, Electro Cardio Gram, Blue tooth ECG monitoring

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## One Boundary-Value Problem For Elliptic Differential-Operator Equations of the Second Order with Quadratic Spectral Parameter

Mohammed RABAH<sup>1</sup> and Rabah HAOUA<sup>2</sup>

<sup>1</sup>Mathematics department/ institute of exact sciences and informatics, Abdelhamid Ibn Badis University, LMPA, 27000  
Mostaganem, Algeria.

<sup>2</sup>Department of technical sciences/ institute of exact sciences and informatics, Abdelhamid Ibn Badis University, LMPA, 27000  
Mostaganem, Algeria.

[\\*mohammed.rabah@univ-mosta.dz](mailto:mohammed.rabah@univ-mosta.dz)

**Abstract** – we prove some new results on operational second order differential equations of elliptic type with general Robin boundary conditions in a non-commutative framework. The study is developed in Hölder spaces under certain natural hypotheses generalizing those of M. Cheggag, in 2008. We give necessary and sufficient conditions on the data to obtain a unique strict solution satisfying the maximal regularity property. This work completes the one given by Mr. Cheggag in 2008 then in 2012 and by Mr. Haoua in 2016.

**Keywords** – second-order elliptic differential equations, Robin boundary conditions, analytic semigroup, non-commutative framework, maximal regularity property

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## The First Ply Failure Analysis of Laminated Beam

Maroua LAYACHI<sup>1</sup>, Abdelhak KHECHAI<sup>2</sup> and Abderahmane GHRIEB<sup>1</sup>

<sup>1</sup>Laboratory of Development in Mechanics and Materials, University of Djelfa, 17000 Djelfa, Algeria

<sup>2</sup>Civil Engineering Research Laboratory (LRGC), University of Biskra, Algeria

[\\*n.maroualayachi@gmail.com](mailto:n.maroualayachi@gmail.com)

**Abstract** – In the present investigation, a composite beam subjected to bending loading is studied to determine the first-ply failure load (FPF). A quadrilateral finite element with 6 degrees of freedom at each node is used to predict the FPF load, Based on the classical laminate theory, To achieve this goal, "Tsai-Wu" failure criteria are implemented. The numerical results obtained by the current element are compared to the analytic results. It is observed that the obtained results are in good agreement with the analytical results, which shows the accuracy of the present element. Finally, the fiber orientation angle will be studied in order to determine and understand its effects.

**Keywords** – Beam, failure, fiber orientations, finite element, Tsai-Wu

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## Assessment of organic pollution of raw wastewater from Oued Ain-Sefra (Mostaganem)

KHELLADI Malika<sup>\*</sup>, MEZOUAGH Amina<sup>2</sup>, MOHAMED SEGHIR Zahira<sup>3</sup> and DEBAB Abdelkader<sup>4</sup>

<sup>1</sup>Process Engineering Department, Mostaganem University, Algeria

<sup>2</sup>Process Engineering Department, Mostaganem University, Algeria

<sup>3</sup>Process Engineering Department, Mostaganem University, Algeria

<sup>4</sup>Department of chemistry, Oran University, Algeria

\*[khelladi\\_m@hotmail.com](mailto:khelladi_m@hotmail.com)

**Abstract** – The main objective of this study is to monitor the evolution of organic pollution of raw wastewater from Oued Ain-Sefra. The latter crosses the city of Mostaganem from south to north and empties into the Mediterranean Sea. All the wastewater of this city is discharged into this Oued of 11 km long and which serves as a collector. Several physic-chemical parameters such as temperature, pH and organic pollution parameters (BOD, COD, TSS) were searched. The monthly withdrawals were made during the year 2022 from September to July. The results of the various analyses showed that the raw wastewater of Oued Ain-Sefra (Mostaganem) has temperatures that vary between 17.2 ° C and 35.3 ° C. The pH fluctuates between 6.1 and 8.1. Total suspended solids range from 632.4 to 1232.2 mg/L. For BOD (biochemical oxygen demand), the pollutant load varies between 589.9 mg/L and 970.6 mg/L and 954.4 mg/L and 1538mg/L for COD (chemical oxygen demand). These important values are due to the domestic origin of the wastewater. The different contents obtained from the parameters analyzed exceed Algerian standards showing pollution affecting the marine environment and aquatic life.

Keywords: Organic pollution, Physic-chemical parameters, Oued Ain-Sefra, wastewater, Standards.

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## Effect of DL-lactic acid on the Behavior of Starch/Microcrystalline Cellulose based Films

Djalila AOUFI<sup>1,\*</sup>, Aicha SERIER<sup>2</sup>

1. Research Center In Industrial Technologies -CITI- BP 64, Route de Dely Brahim, Chéraga, Alger 16014
2. Laboratory of Coating, Materials and Environment, Department of Industrial Process Engineering, M'hamed Bougara University (UMBB), Boumerdes, Algeria.

\* [aoufidjalila@yahoo.com](mailto:aoufidjalila@yahoo.com)

**Abstract** – The aim of the present work is the development and characterization of new formulation of biodegradable composite based on polysaccharides blend and DL-lactic acid as new plasticizer. Our study consists in evaluating of the influence of the DL-lactic acid content on the behavior of obtained films. The developed films are studied in order to use them as new formulations to produce food packaging. The obtained films are generally homogeneous, thin, and slightly flexible. All films were easily removed from the glass plate and show visually smooth surfaces. DL-lactic acid (LA) was chosen as a plasticizer. Its presence in the films brought about a chemical modification of the polymer which was highlighted by the Fourier transform infrared analysis. The hydration properties, the solubility coefficient and the water vapor permeability have been improved.

**Keywords** – Starch, microcrystalline cellulose, DL-lactic acid, Films, Casting.

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## A general decay result of a wave equation with a dynamic boundary control of diffusive type

Chahab Farida<sup>\*</sup>, Benkhedda Hanane<sup>2</sup> And Benaissa Abbas<sup>3</sup>

<sup>1</sup>Department of mathematic/Djilali liabes University, Algeria

<sup>1</sup>Department of mathematic/Djilali liabes University, Algeria

<sup>1</sup>Department of mathematic/Djilali liabes University, Algeria  
hananeben05@gmail.com

**Abstract** – We study a wave equation with a dynamic boundary control of diffusive type. We establish optimal and explicit energy decay formula by using resolvent estimates. Our new result generalizes and improves the earlier related results in the literature.

**Keywords** – general decay rate, general boundary dissipation of diffusive type, wave equation, well-posedness

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## Physical properties of ZnO coatings deposited by spin-coating technique

T. Kacel\*,<sup>1</sup>, A. Boukerika<sup>2</sup>, M.Hemmous<sup>2</sup>

<sup>1</sup>Research Center in Industrial Technologies CRTI,  
BP64 route de Dely Ibrahim Cheraga, Algeria

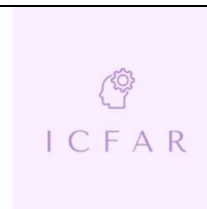
<sup>2</sup> Nuclear Research Centre of Algiers,  
2Bd Frantz Fanon, BP399, Alger-Gare, Algiers, Algeria

\* [hmkacel@gmail.com](mailto:hmkacel@gmail.com)

**Abstract** – In this study, zinc oxide thin films were deposited onto glass substrates by spin-coating method from a precursor solution containing zinc acetate dissolved in methanol. After deposition, the films were preheated at 300 °C for 3 min, in order to remove unwanted materials and then annealed at 500 °C for 2 h for complete oxidation. The microstructure and optical properties of ZnO films were characterized by XRD and UV-visible techniques in order to observe the influence of precursor concentration. X-ray diffraction showed that ZnO films were polycrystalline and have the hexagonal structure. The crystallites are preferentially oriented with (002) and the appearance of only (002) c-axis orientation for precursor concentration at 0.1 M. UV-vis has shown that the films were highly transparent under visible light and had a sharp absorption edge in the ultraviolet region 380 nm. The measured optical band gap values of the ZnO thin films were around 3.25-3.28 eV. The correlation between the precursor concentration, structure and optical characteristics of the respective thin films were established.

**Keywords** – ZnO, Thin films, spin-coating, precursor concentration, XRD

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## Study On The Adsorption Performance For Heavy Metals Using Activated Carbons Derived From Agricultural Waste

Mohamed Nadjib REBIZI

*Organic Chemistry and Natural Substances Laboratory, University of Zian Achour, Djelfa, Algeria*

*rebizi-nadjib@hotmail.fr*

**Abstract** – The increasing demand for adsorbents used in environmental protection processes has made them more and more expensive, which has prompted further research into the manufacture of new, less expensive adsorbent materials from non-conventional materials, specifically from agricultural waste, with a view to applying them to the adsorption of heavy metals. To this end, we prepared different carbons by chemical means using orthophosphoric acid at decreasing concentrations and a relatively low activation temperature, with the aim of using the one that develops the best porosity. We obtained high mass yields, but which decreased with the acid concentration. Different analytical methods were used to characterise the prepared carbons. The study of the development of porosity by the gas adsorption technique (B.E.T.) led to the H<sub>3</sub>PO<sub>4</sub> acid has a very positive effect on the development of the porous texture, X-ray diffraction allowed us to conclude that the carbons obtained are amorphous and that their structure is different from that of graphite. Infrared analysis highlighted the functional groups on the surface, developed during activation. Batch tests confirmed the performance of agricultural waste activated carbon in the removal of cadmium and zinc. In this part of the work, we also examined the influence of some parameters influencing the adsorption. The study showed that the adsorption of metals depends on the pH of the solution, the initial concentration of the metal and the dose of carbon. This is to be expected, as it is in the pH range of maximum adsorption that high adsorption capacities were obtained. From the above, agricultural waste activated carbon can be a cheap and effective adsorbent in the treatment of heavy metal polluted waters.

*Keywords* – Adsorption; activation; agricultural waste; heavy metals; carbon.

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## **Applications of non-destructive testing and magnetic characterization to evaluate structural changing and corrosion behavior of duplex stainless steel aged at hot temperature**

A.Ziouche, N.Boucherou, M.Mokhtari, A.Haddad, A.Hammouda, N.Zoubiri

*Research Center in Industrial Technologies (CRTI), P.O. Box 64, Cheraga, 16014 Algiers, Algeria.  
Univeristy of EChahid Hamma Kakhder, 39000 loued Algeria 3 University larbi Ben M'hidi, Oum ElBouaghi, Algeria  
aicha\_ziouche@yahoo.fr*

**Abstract** –Stainless steel is widely used in different sectors of industry; it presents a higher corrosion resistance than ordinary steel. The excellent combination of mechanical properties and corrosion resistance is the main reason for their increasing application in various industries. in this paper, the corrosion of aged Duplex stainless steel 2205 in 1 M HCl and 3.5 g/l NaCl, was evaluated by eddy current and magnetic method. the implantation of non destructive testing such as eddy current and hysteresis cycle, can give more information about the modification in structure. in the both solution, the duplex 2205 present a good corrosion resistance because it builds up passive film. when we increase the emerging time for the two environment, we can observe a dissolution of the material, especially in the case of acidic solution.

**Key Words:**

*Corrosion, Acidic Media; Chloride Media; Duplex Stainless Steel; eddy current, VSM, Microstructure, Hardness.*

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## The Impact of Socio-Cultural Dimensions on The Traditional Architecture of The Souf

Asma Femmam, Leila Sriti and Nadia Femmam

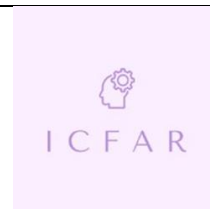
*Laboratory of design and modelling of architectural ambiances and urban forms  
(LACOMOFA), Architecture Department Mohamed Khider University, BP 145 RP, Biskra, 07000, Algeria*  
*Laboratory of design and modelling of architectural ambiances and urban forms  
(LACOMOFA), Architecture Department Mohamed Khider University, BP 145 RP, Biskra, 07000, Algeria*  
*Laboratory of design and modelling of architectural ambiances and urban forms  
(LACOMOFA), Architecture Department Mohamed Khider University, BP 145 RP, Biskra, 07000, Algeria*

*asma.femmam@univ-biskra.dz*

**Abstract** – The traditional architecture of The Souf presents an optimal sample of vernacular buildings. The inhabitants of El Oued used to build houses according to their social, cultural and climatic needs. But nowadays, the neglect of environmental specificities and the rapid production of residential buildings has created high energy buildings that depend on the abusive and irrational exploitation of energy resources (41% of total electricity consumption) to meet the needs of artificial lighting, heating and cooling of households. The city of El Oued (Algeria) is characterized by a hot arid climate, where the buildings produced in the city no longer meet the harsh climatic conditions during summer, which pushes the inhabitants to turn to mechanical means to ensure a certain level of comfort, and so the cost is higher each year. To reduce this energy consumption and ensure optimum climatic comfort we must act on the architectural pre-design process. Our research aims to apply a qualitative analyse on the traditional houses of the Souf, to understand the social practice of the inhabitants and the different passive strategies and cooling systems of the buildings, then compare the results with the contemporary productions, located in El Oued. After that, we are going to apply the Mahoney tables and Psychometric chart to illustrate the convenient passives strategies in order to correct the design problems in the contemporary buildings and achieve thermal comfort by elaborating a grid of recommendations that the architect can use during the sketching and designing phase.

**Keywords** – *Thermal comfort, Social practice, Passive strategies, Hot dry climate, Soufi traditional architecture, Grid of recommendations.*

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## Phytochemical Screening And Biologicals Activites Of The Methanolic Exgtract Of The Medicinal Plant Ephedra Alata Alenda

DJAALALI Ilhem, GUEDRI Kamilia

*1,2Laboratory of Toxicology and Ecosystems Pathologies, Faculty of Exact Sciences and Nature and Life Sciences, Larbi  
Tebessi University, Tebessa, Algeria*

*ilhem.djaalali@univ-tebessa.dz*

**Abstract-** Our work focuses on the study phytochemical and the antioxidant and antibacterial ac- tivity of the methanolic extract of " Ephedra alata alenda" the phytochemical study made it possible to deduce that this plant is rich in (Alkaloids, Tannins, Flavonoids, Polyphenols). In vitro antioxidant activity was evaluated by measuring the trapping power of the DPPH.

The antibacterial activity of methanolic extract was tested against three bacterial strains compared to the control.

Our results show that the bacertial strains exhibit varying degrees of sensitivity to the extract.

**Keywords:** *Antioxidant activity, Methanolic extract, Ephedra alata alenda, phytochemical test, Antibacterial activity.*

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## Coagulation Flocculation Process for Leachate Treatment

Kamilia MADI, Derradji CHEBLI and Sabiha HAMIDOUCHE

*Université FERHAT Abbas, Sétif, Algérie.*

*Université FERHAT Abbas, Sétif, Algérie*

*Université Akli Mohand Oulhadj Bouira, Algérie.*

[kamilia.madi@univ-setif.dz](mailto:kamilia.madi@univ-setif.dz)

**Abstract** – Indeed, landfills can be the source of several sources of environmental nuisance such as: odour emission, noise, dust, biogas production and especially leachate. Given the negative impact these leachates can have on the environment, special attention must be paid to these leachates in order to preserve any intrusion into the groundwater or pollution of the surrounding aquatic environments. Coagulation flocculation can be used successfully in the treatment of old leachates. It is widely used as a pre-treatment before reverse osmosis or before biological processes or as the final treatment step to eliminate the bio-recalcitrant organic matter. The objective of this study is therefore to study the effectiveness of flocculation coagulation processes for leachate treatment, particularly in terms of turbidity, sludge production and color removal. Landfill leachates have been identified as potential sources of environmental contamination causing pollution from various sources. To achieve the objective of reducing this pollution a coagulation-flocculation process was applied for the treatment using two coagulants ( $\text{FeCl}_3$ ;  $\text{Al}_2(\text{SO}_4)_3$ ) and an alginate flocculant of sodium, this treatment resulted in a relatively large reduction in the suspended matter. To improve the efficiency of pollution removal, complementary treatments (sand filtration and active charcoal filtration) have been applied. In the result the coagulant, ferric chloride  $\text{FeCl}_3$  (3g/L), we obtained an 85.7% abatement rate that is more effective than the aluminum sulphate  $\text{Al}_2(\text{SO}_4)_3$  with an equal abatement rate of 54.44%.

*Keywords – leachate, pollution, treatment, coagulation-flocculation, finishing treatment*

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## Data Analysis of Moroccan Secondary School From 2004 to 2021: Case Tangier Tetoun Al Houceima Region

*Bayad Fouzia, Azyat Abdelilah, Ben Achhab Nizar and Raissouni Naoufal*

*Remote Sensing & GIS Unit, ENSA, Tetuan, Morocco*

*MIA Research Unit, ENSA Tangier, Morocco*

*Remote Sensing & GIS Unit, ENSA, Tetuan, Morocco*

*Remote Sensing & GIS Unit, ENSA, Tetuan, Morocco*

*fouziabayad1@gmail.com*

**Abstract** – Data analysis processes allow recognizing issues, patterns, trends, causes, parameters, and possible results for the reason to realize the monitoring, evaluation and assessment functions. In this work, we have outlined the fundamental use of Data Analytics to improve Decision-Making (DM) in Moroccan Education System. We have made a data analysis for education in Morocco throughout 18 years from 2004 to 2021. First of all, we generally have collected education data from the HCP (High Commission for Planning) about the students' enrollment in the secondary schools of Tangier-Tetouan-Al Hoceima Region of Morocco from 2004 till 2021. Furthermore, for the eight different province of the Tangier-Tetouan-Al Hoceima Region, we have gathered data for secondary school enrollments. Secondly, we have maintained to Data Cleaning Process (DCP). Thirdly, we have stored our data. And Finally, we have visualized this data with charts to analyze them. The results showed that the secondary schools' student enrollment had a steady increase from 2004 to 2021 in the perspective provinces. The study showed that the province Tanger-Assilah has the highest enrollment rate while Fahs-Anjra has the lowest enrollment rate. According the results, the secondary schools students' enrollment has increased from 77295 to 169599 in the Tangier-Tetouan-Al Hoceima Region of Morocco from 2004 till 2021.

*Keywords – Secondary Schools, School Enrollment, Tangier-Tetouan-Al Hoceima Region, Data Cleansing, Data Visualization*

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## The Influence Of The Fiber Orientation And Eccentricity Ratio Of The Rectangular Hole On The Natural Frequency Of Laminated Plates

LAYACHI Safa, TATI Abdelouahab Maroua LAYACHI

*Department of civil engineering/ Civil Engineering Research Laboratory (LRGC), University of Biskra, Biskra, Algeria.  
Department of civil engineering / Energy and Materials Engineering Laboratory (LGEM), University of Biskra, Biskra,  
Algeria.*

*Laboratory of Development in Mechanics and Materials, University of Djelfa, 17000 Djelfa, Algeria*

[a.safalayachi@gmail.com](mailto:a.safalayachi@gmail.com)

**Abstract** – The present investigation consists of studying the influence of the fiber orientation and eccentricity ratio of the rectangular hole on the natural frequency of a rectangular plate with the change of position of the hole along its diagonal axis. By using a quadrilateral finite element with five degrees of freedom based on the first-order theory of transverse shear, the results obtained are compared with the 3D elasticity of Nour. This comparison showed better performance and accuracy of the element used.

*Keywords* – the natural frequency, laminated plate, fiber orientation, the eccentricity of the hole and finite element

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## Insight Into Structural, Electronic, and Magnetic Properties of Full-Heusler Alloys Ir<sub>2</sub>VSn: Ab Initio Study

Hadjer Frioui, Athmane Meddour

Laboratoire de Physique des Matériaux (L2PM), Université 8 Mai 1945, BP 401

Guelma 24000, Algeria

[friouihadjer@gmail.com](mailto:friouihadjer@gmail.com)

**Abstract** – We have studied the structural, electronic, and magnetic properties of the new full-Heusler alloy Ir<sub>2</sub>VSn with the help of ab initio calculation using Full Potential-Linearized Augmented Plane Wave (FP-LAPW) method which is based on density functional theory (DFT) implemented in the wien2k code with Generalized Gradient Approximation (GGA). The computed results indicate that the compound is more stable in the Cu<sub>2</sub>MnAl prototype in the ferromagnetic phase. The negative formation energy confirms its stability, so this full heusler alloy can be easily synthesized experimentally.

In addition, Ir<sub>2</sub>VSn is a metallic and magnetic material for the electronic and magnetic properties, as a result, our results show that this material is a good candidate for spintronic applications.

*Keywords* – DFT; Full Heusler alloy; Magnetic properties; Spintronic.

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## **New Compound Poisson-Lindley distribution**

Grine Razika

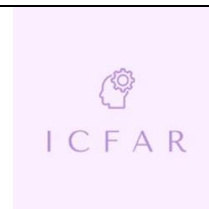
*Department of Mathematics/Faculty of Science and Technology, Chadli Bendjedid University, Algeria*

*grine-razika@univ-eltarf.dz*

**Abstract** – In this work we propose some distribution where the Poisson Lindley distribution is a particular case. Properties have been studied such as estimation by the method of moments and the maximum likelihood method, quantile function, simulations have been applied.

*Keywords* – *Poisson Lindley distribution, Poisson quasi-Lindley distribution, Gama Lindley distribution, moment estimation, maximum likelihood.*

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## New Hybrid Composite With Mmelamine And Phosphorus.

LATOUI Mourad, AIT YOUCEF Hakima and BENGHANEM Fatiha

*Process engineering department / Electrochemistry, Molecular Engineering and Redox Catalysis Laboratory, Ferhat  
Abbas University Setif 1, Algeria*

[latmourad@gmail.com](mailto:latmourad@gmail.com)  
[latoui\\_mourad@univ-setif.dz](mailto:latoui_mourad@univ-setif.dz)

**Abstract** – In our daily lives, plastic is the most commonly used material. It plays an important role in many areas of use, such as plastic houses, electrical materials, and automobiles. However, its use is severely restricted in many uses due to its large ignition capability, so it is very important to improve its flame resistance.

Flame retardants are materials that prevent or slow down fire development and are critical additives in plastics.

With the implementation of new environmental and health regulations, phosphorus-based flame retardants find a special place in the market for these additives. It's a very promising category of extras. Melamine-based flame retardants provide very excellent flame retardant properties.

In this work, we manufactured and distinguished a new phosphorus hybrid compound based on melamine. Its chemical structure was determined by infrared and ultraviolet radiation as well as its melting point study, which is due to the combination of thermal properties of flame retardants: nitrogen caused by phosphorus.

*Keywords – melamine, plastic, flame retardants, phosphorus*

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## Condensation, Desalination, And Water Recycling To Encounter Water Stress

*Rafika HELAIMIA*

*Department of English, University of MCM, Soukahras, Algeria*

*r.helaimia@univ-soukahras.dz*

**Abstract** – Water is a gift of life from Allah. In Al-Quran, it is stated “And We sent down from the sky water (rain) in (due) measure, and We gave it lodging in the earth, and verily, We are able to take it away.” (1). Though water is indispensable for life and livelihoods, it is becoming a world-pressing societal and geopolitical critical issue, knowing that 800 million people worldwide cannot afford primary access to potable water and that nearly 2.2 billion people lack access to a safe water supply. As a result, freshwater scarcity is now the world's second most pressing concern, after the prompt population increment issue. If the problem of freshwater scarcity persists, ‘the world will miss water-related SDGs by a wide margin’; more than 40% of the world's population will be living in ever-seriously water-stressed regions by 2035 (2); ecosystems will become weakened and will be unable to meet population freshwater supply ; and developing countries will be the most affected, with 80% of their illnesses caused by a lack of access to water as well as poor water quality. To tackle the increased water shortage, reasonable water management methods are required. This article proposes three efficient sustainable water techniques for producing fresh water and thus meeting water scarcity's massive demand, along with their benefits and drawbacks. They are Condensation, desalination, and water recycling.

*Keywords – water scarcity, drivers, Condensation, desalination, water recycling*

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## Smart Agriculture An Efficient Way To Preverse Plant Resources

FERFAR Meriem, NARSIS Souad and DRIOUCHE Youssouf

*Environmental Research Center, Sidi Amar Campus, BO: 2024, Annaba, 23005, Algeria.*

*m.ferfar@cre.dz*

**Abstract** – Smart agriculture is becoming increasingly important due to a combination of global population growth, growing demand for higher crop yields, the need for efficient use of natural resources, and the increasing use and need for climate-smart agriculture.

This agriculture plays a crucial role in sustainable agriculture. It is managed by software and monitored by sensors; using big data and new technologies such as IoT, drone imagery and smartphone apps to increase yield and optimize product quality, while consuming less energy and inputs (fertilizers, crop protection products, water).

One of the advantages of this type of agriculture is the preservation of plant resources and different crops. In this case, we talk about precision agriculture, which is based on the increased control of the production and growth cycle of the crop. While taking into consideration, the data collected relating to the quality of the soil, climatic and physiological parameters such as humidity, temperature, nutrient content, ... etc. This will also help us to detect anomalies in the growth of crops and allow us to eliminate the risk of yield loss. The control systems manage the input of sensors, providing remote information for supply and decision support, through these intelligent devices, several processes can be activated at the same time, and automated services improve the quality and volume of products by better controlling the production processes.

*Keywords – Smart agriculture, Precision agriculture, Plant preservation, Optimization, Yield.*

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## Study And Sizing Of a Fuel Cell Storage System Fuel In a House

CHOUITEK Mama, NEDDAR Houaria

*Maintenance and industrial safety institute, University Es Senia 2 of Oran, Algeria  
Electrical engineering department, University of Mostaganem ,Algeria*

*chouitek98@yahoo.com*

**Abstract** –This communication deals with a type of electrical energy production by hydrogen energy vector and more precisely the fuel cell. The operation of the battery, its characteristics and operating technologies. This work is devoted to the design of a chalet powered mainly by a proton exchange membrane fuel cell (PEMFC). This chalet is located on the mountains of the Aurès massif, on the border of the city of BATNA and the city of KHENCHELA in ALGERIA and its modeling. This type of fuel cell is used in several fields such as: public transport, on-board and stationary systems. The operating mechanism of this battery is very interesting because it converts chemical energy into electrical energy according to oxidation and reduction reactions, with the release of water and heat. We calculated in the sizing according to the electricity needs, the water needs and the thermal needs of our chalet and through these calculation results, we chose the PEM Vitovalor pt2 technology, which best meets our needs for this chalet. Modeling and simulation on MATLAB SIMULINK allowed us to understand the polarization and power characteristics as well as the influence of the parameters on the operation of the cell.

*Keywords –fuel cell; hydrogen; oxygen; dwelling; cogeneration*

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## Study of A Behavior in Path Drying Humidification of A Soil

SI AHMED Chabane, BOUZIDI Mohamed amin , OULED AMEUR Ahmed and Meziani Belkacem

Laboratory LGCA, Faculty of Technology, University of Bejaia, 06000 Bejaia, ALGERIA

*chabane.siahmed@univ-bejaia.dz*

**Abstract** – Soil and rock mechanics has generally been concerned with the study of materials that are totally saturated with water or perfectly dry. However, in civil engineering, environmental engineering or reservoir engineering, one frequently encounters problems involving soils or rocks under partial saturation. Failures in slopes and embankments are often related to changes in the degree of saturation. The air-water-solid interaction makes the mechanical behavior as well as the hydric aspects much more complicated than in saturated soil.

Among all the existing materials, the so-called evolving unsaturated materials (whose physical and mechanical properties evolve over time), that is to say that can change nature or structure and therefore behavior in the presence of water and following their extraction, and therefore are the subject of special attention.

The purpose of this study is to carry out a test campaign in the laboratory on an unsaturated soil in a drainage-wetting path, refers to the identification of the hydric behavior of a marl soil on a drainage-wetting path; it is a study that fits into the construction project.

In the interest of better mastering the influence of suction on the behavior of unsaturated soils (in their natural state), there is considerable interest in knowing how to control or impose suction in geotechnical tests in the determination of the retention curve.

**Keywords** – *drying; soil; humidification; characterization;*

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## Effects of Jute Fiber on the Mechanical Properties of Concrete

Muhammad Sudais KHAN, Shaheed ULLAH

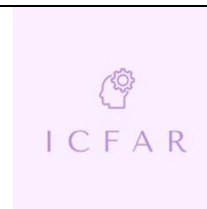
*Capital University of Science and Technology, Islamabad Pakistan*  
*Capital University of Science and Technology, Islamabad Pakistan*

*Sudaisbtk2@gmail.com*

**Abstract** – Natural fibres are a great substitute since they are readily available in fibrous form and reasonably priced. Jute fibre (JTF) can be used in concrete to improve its durability and longevity. The characteristics and possible applications of various jute fibres in concrete are discussed in this paper. The fixed ratio of jute fiber is important to improve the strength of concrete. This review's major focus is on summarizing JTF's impact on concrete's fresh qualities, strength metrics. Jute fibres enhanced concrete's strength and durability but reduced its fluidity similarly to synthetic fibres. Shorter length of jute fiber has positive effect on the properties of concrete. On the endurance of fibre concrete with JTF, Jute fibre is excellent. Furthermore, The optimum JTF level in concrete is crucial since, due to a lack of fluidity, a higher dose may have a negative impact on strength and durability. Depending on the length and thickness of the jute fibres, the appropriate dose of JTF is often between 1% and 2%. The evaluation also focuses on the crucial data that prospective researchers would require in order to improve the characteristics of fibre concrete using JTF.

*Keywords – Effects of jute fibre; Concrete Durability; Concrete strength; Improve Quality.*

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## Microstructural, Thermal Stability And Hyperfine Properties Of FeCo-2.5wt.%Ni Powders Prepared By High Energy Ball Milling

M. BELDJEHEM, N. BENSEBEAA, S. ALLEG, J.J. SUNOL and J.M. GRENECHE

*Laboratoire de Magnétisme et de Spectroscopie des Solides (LM2S), Département de Physique – Faculté des Sciences,  
Université Badji Mokhtar – Annaba - B.P. 12 (23000) - Algérie.*

*Departament de Fisica, Universitat de Girona, Campus Montilivi, Girona 17071, Spain.*

*Institut des Molécules et Matériaux du Mans, IMMM UMR CNRS 6283, Université du Maine,  
72085 Le Mans cedex 9, France.*

belmeriem1@gmail.com

**Abstract-**Nanocrystalline Fe<sub>50</sub>Co<sub>47.5</sub>Ni<sub>2.5</sub> alloy powder was prepared by high energy ball milling in a planetary ball mill Fritsch P7 under argon atmosphere. Microstructural, thermal and hyperfine properties were followed by means of X-ray diffraction (XRD), differential scanning calorimetry and <sup>57</sup>Fe Mössbauer spectrometry, respectively. The XRD results reveal the coexistence of *bcc*  $\alpha$ -Fe type, *bcc* FeCo, and *hcp* Co-type structures. The broad exothermic reaction could be due to recovery and strain relaxations, while the endothermic peaks can be attributed to the  $\alpha \rightarrow \alpha'$  disorder-order transformation and  $\alpha \rightarrow \gamma$  phase transition of the FeCo-type SS. Ni substitution for Fe and Co leads to the decrease of both the  $T_{\alpha \rightarrow \alpha'}$  ordering and  $T_{\alpha \rightarrow \gamma}$  transformation temperatures. The room temperature Mössbauer spectra display the presence of higher ( $B_{hyp} > 33$  T) and lower ( $B_{hyp} < 33$  T) hyperfine magnetic fields which confirms the formation of Fe and Co-rich environments.

**Keywords:** FeCoNi alloys; High energy ball milling; X-ray diffraction; Hyperfine properties ; Thermal analyses.

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## GIS Based Approach For The Identification Of Recharge Zones In Spring Catchments In The Indian Himalayan Region (IHR)

Syed ROUHULLAH Ali and Kireet KUMAR

NMHS-PMU, G.B. Pant National Institute of Himalayan Environment, Almora, Uttarakhand, India

*agaroooh@gmail.com*) Email of the corresponding author

**Abstract** – Groundwater is a major source contributing to the total annual supply. The explosive growth and uneven distribution of population, poor irrigation practices, rapid urbanization, large-scale deforestation, and improper land use practices create a depletion of groundwater resources and result in the drying of springs or changing their behavior from perennial to seasonal in the Indian Himalayan Region (IHR). Therefore, it increases the demand for water for agriculture, household, and industry in the region. To understand the water resources in the region and how to rejuvenate the spring catchment, the groundwater's fundamental characteristics and recharge need to be analyzed. Water resource management relies heavily on accurately identifying the groundwater recharge zones. This paper presents the possible water recharging zones in the various catchments selected in the Indian Himalayan Region. Weighted overlay index (WOI) tools in a geographical information system (GIS) and analytic hierarchy process (AHP) pairwise matrices were used to identify areas with the potential to act as catchment recharge zones in the area. Most of the researched area was found to be in a zone with modest potential for recharging groundwater supplies. The construction of check dams may be an appropriate recharge strategy since it will increase the discharge of springs and aid in making them perennial. The maximum springs are located in forested areas, one of the acceptable recharge potential sites in the IHR. Other measures include staggered contour trenches, pits, or other structures to manage watersheds better and replenish spring water in the IHR. The integrated remote sensing and GIS techniques were found to be efficient methods for recovering the water and determining suitable water harvesting and groundwater recharging sites to ensure better water accessibility in the IHR. The developed zone maps provide decision-makers with valuable knowledge in management plans for recharging groundwater resources and rejuvenating spring waterbodies in the region.

*Keywords* – Groundwater, GIS, Recharge zones, Spring waterbodies, Indian Himalayan Region

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## Influence of Hf Impurities Doped On Alkaline Earth Oxide CeO<sub>2</sub> On Structural, Electronic And Optical Properties: An Ab-Initio DFT Study

Benmalek AIDA, Doughmane MALIKA, Chettibi SABAH

*Material sciences department/ Materials Physics Laboratory, Université8 Mai 1995, Guelma, Alegria.*

*Material sciences department/ Materials Physics Laboratory, Université8 Mai 1995, Guelma, Alegria.*

*Material sciences department/ Materials Physics Laboratory, Université8 Mai 1995, Guelma, Alegria.*

*benmalekaida77@gmail.com*

**Abstract** – We systematically investigate the structural, electronic, and optical properties of Ce<sub>1-x</sub>M<sub>x</sub>O<sub>2</sub> (M = Hf; x = 0.25) fluorite-type oxides by using the FP-LAPW method in the framework of the DFT as implemented in Wien2k codes. Comparison of all the properties was carried of un-doped CeO<sub>2</sub>, and Hf doped CeO<sub>2</sub>. The exchange correlation potential was treated by the generalized gradient approximation (GGA) in the Perdew-Burke-Ernzerhof potential for solids (PBE sol). The calculated equilibrium lattice parameter, electronic, and optical properties for CeO<sub>2</sub> are in good agreement with the available experimental data and other theoretical results. Deformation in the structure was observed due to the ionic radii and electronic configuration of the dopant atom, which decreased the lattice parameter after substituting the Ce atom by Hf. While analyzing the electrical properties, the reduction value of the band gap was changed, as a result of which the co-efficient of absorption was increased in the region of visible light, thus making it a potential candidate for applications in the field of optoelectronics.

*Keywords* – Hf doped CeO<sub>2</sub>, fluorite-type, FP-LAPW, wien2k, optoelectronics.

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## Substitution Of Calcined Bentonite From The Decoloration Of Vegetable Oils In Cement

OULD Amer Ahmed , BOUZIDI Mohamed Amin, MEZIANI Belkacem, Si Ahmed CHABANE

*Laboratory of Construction Engineering and Architecture 1, Faculty of Technology, University of Bejaia, Algeria*

[ahmed.ouldamer@univ-bejaia.dz](mailto:ahmed.ouldamer@univ-bejaia.dz) [mohamedamin.bouzidi@univ-bejaia.dz](mailto:mohamedamin.bouzidi@univ-bejaia.dz) [belkacem.meziani@univ-bejaia.dz](mailto:belkacem.meziani@univ-bejaia.dz)  
[chabane.siahmed@univ-bejaia.dz](mailto:chabane.siahmed@univ-bejaia.dz)

**Abstract-** The valorization of industrial waste in building materials is nowadays an international challenge whose development is a problem of time, where researchers try to find low-cost equipment adapted to the field of use.

The use of supplementary materials in the cement industry is constantly increasing and the valorization of these additions obtained from natural sources or from leftover industrial materials is a key option, In addition, the use allows the reservation of natural resources and the release of spaces dedicated to the storage of waste and reduce the consumption of clinker and contributes to solve environmental problems in a simple and economic way.

The aim of this experimental work is to study the proportion of used decolorizing bentonite on the mechanical behavior and sustainability of composite cement and mortar, The results obtained show that the partial compensation of cement powder with 15% gives the best values.

*Keywords – building materials, sustainability, industrial waste, Valorization*

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## Influence Of Membrane Load And Fiber Orientation On The Natural Frequency Of Laminated Plates

Maroua LAYACHI, Abdelouahab TATI and Safa LAYACHI

*Laboratory of Development in Mechanics and Materials, University of Djelfa, 17000 Djelfa, Algeria  
Energetic and Material Engineering Laboratory (LGEM), University of Biskra, Algeria  
Civil Engineering Research Laboratory (LRGC), University of Biskra, Algeria*

*n.maroualayachi@gmail.com*

**Abstract** – The objective of this study is to study the effect of membrane load on the natural frequency of laminated composite plates. A quadrilateral finite element with five degrees of freedom at each node is used, based on the first-order shear theory. The numerical results obtained by the present element were compared with those obtained by other analytic solutions and finite element models in the literature, and the accuracy and performance of the current model were demonstrated. Finally, the fiber orientation angles were studied in order to determine and understand their influence on the natural frequency.

*Keywords – membrane load, natural frequency, fiber orientations, laminated plate, finite element .*

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## **Investigating Postbuckling Response of FG Porous Beams Considering Geometrical Imperfections**

Ismail Bensaid, Ahmed Saimi and Ihab Eddine Houalef

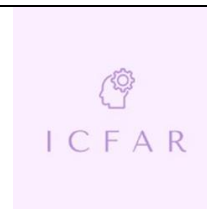
*IS2M Laboratory, Mechanical engineering Department, Faculty of Technology, University of Abou Beckr Belkaid (UABT),  
Tlemcen, Algeria*

*bensaidismail@yahoo.fr*

**Abstract** – This paper is concerned to investigate the postbuckling behavior of functionally graded (FGM) beam and containing porosities. The Euler-Bernoulli beam model is employed in this study, in which its material properties vary gradually in the thickness direction by a power law form of the Ceramic-Metal constituents. Due to a technical stress in production process of the beam structure, the initial geometrical imperfection resulting from is incorporated in the present analysis. The governing equations of motions are extracted by utilizing Hamilton's process and solved by Galerkin's semi-analytical procedure for both clamped ends conditions. The obtained results are compared with available similar paper in the same field. Finally, a parameter study is provided to explore the effects of various physical and geometrical parameters.

*Keywords – Porous Beam, FGMs, Postbuckling, Porosities, Imperfections*

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## Antioxidant, Enzyme Inhibition And Toxicology Studies of Methanol Extracts of Selected Medicinal Plants

Hiba Shahid, Syed Ali Raza Naqvi , Amjad Hussain, Syed Muhammad Rehan Hasan Shah Gilani,  
Naseem Abbas and Sadaf Ul-Hassan

*Department of Chemistry, Government College University Faisalabad, Pakistan*

*Department of Chemistry, Government College University Faisalabad, Pakistan*

*Department of Chemistry, University of Okara, Pakistan*

*Institute of Chemical Sciences, Bahauddin Zakaria University Multan, Pakistan*

*Institute of Chemical Sciences, Bahauddin Zakaria University Multan, Pakistan*

*Department of Chemistry, COMSATS University Islamabad, Lahore Campus, Pakistan*

*drarnaqvi@gmail.com*

**Abstract** – The purpose of this work was to study the biological activities of methanolic extracts of *Tagetes erecta*, *Calendula officinalis* and *Murraya koenigii* on alpha-amylase at varying concentrations. Antioxidant activities of these medicinal plants were also planned to investigate antioxidant effect against the oxidative stress. The present study intends to screen alpha amylase inhibitors from natural sources like plants in order to minimize the toxicity and side effects of the inhibitors currently used to control hyperglycemia. The percentage inhibition of methanolic extracts of alpha amylase was noted in the range of 11.49 to 50.56 percent and IC<sub>50</sub> in the range of 04.09±0.05 to 07.39±0.23 µg/ mL respectively at the mentioned concentrations. The percentage urease inhibition range of leaves extracts at 300 to 400 rpm of *Tagetes erecta* were in range of 52.32 to 2.11 %. Methanolic extracts of *Tagetes erecta* showed the total phenolic contents in the range of 0.03±0.24 to 0.42±0.63 mg GA/ 100g for leaves extracts and 0.006±0.39 to 0.09±0.28 mg GA/100g for stems extracts. 0.02±0.32 to 0.17±0.38 mg GA/ 100g TPC of curry leaves and 0.02±0.32 to 0.17±0.38 mg GA/ 100g, 0.001±0.39 to 0.18±0.39 mg GA/100g for leaves and stem extracts of *Calendula officinalis*. The percentage radical scavenging activity of leaves extracts of *Tagetes erecta* was noted in the range of 2.13 to 76.13 % and 3.73 to 46.31 % by using DPPH and FRAP antioxidant assays. Ingestion of *T. erecta* leaf extract significantly reduced protein and lipid oxidation and lessened DNA damage, which is interpretable as a decrease in oxidative stress brought on by NDEA. The results of the work therefore, clearly indicate the potential of these extracts to manage hyperglycemia and oxidative stress. The evaluation of enzyme inhibition and antioxidant potentials of plant extracts has been done by using 96-well microplate reader technique. Data obtained has been statistically analyzed using appropriate statistical tools.

**Keywords** – *Tagetes erecta*, *Calendula officinalis*, *Murraya koenigii*, antioxidant, enzyme inhibition and comet assay.

## Development Of Technetium-99m Labeled Nanoparticles Loaded With Antimicrobial Agent As SPECT Imaging Agent

Vaneeza Javed, Syed Ali Raza Naqvi , Amjad Hussain , Syed Muhammad Rehan Hasan Shah Gilani,  
Naseem Abbas and Sadaf Ul-Hassan

*Department of Chemistry, Government College University Faisalabad, Pakistan*

*Department of Chemistry, Government College University Faisalabad, Pakistan*

*Department of Chemistry, University of Okara, Pakistan*

*Institute of Chemical Sciences, Bahauddin Zakaria University Multan, Pakistan*

*Institute of Chemical Sciences, Bahauddin Zakaria University Multan, Pakistan*

*Department of Chemistry, COMSATS University Islamabad, Lahore Campus, Pakistan*

*drarnaqvi@gmail.com*

**Abstract** – Radiotherapy is an innovative, targeted therapy that drives down high drug concentrations by improving the pharmacokinetics of the drug. This leads to better diagnosis and treatment outcomes. As a novel imaging platform for tumor targeting, moxifloxacin-chitosan nanoparticles as a drug delivery system may be manufactured using an ionic gelation process. This technology also serves as a potential drug delivery system. Chitosan nanoparticles have received a lot of interest especially due to their all-encompassing antibacterial properties. The purpose of this research was to develop radiopharmaceuticals that are non-toxic to the human body, have greater imaging efficacy, better accumulation at the targeted location, improved bioavailability, and increased exposure. Chitosan is a substance that is well-suited for usage in medical applications because of a variety of its biological characteristics. Biodegradability, non-toxicity, anti-fungal actions, faster wound healing, and immunologic activation are some of these qualities. In this study, 103nm-sized chitosan nanoparticles exhibit a zeta potential of  $3.3 \pm 0.4$  mV, a high moxifloxacin loading efficiency of 99.3%, and drug entrapment efficacy of 85.66%. Moxifloxacin-chitosan nanoparticles were radiolabeled with technetium-99m using stannous chloride as a reducing agent and a pH of 6. The radionuclide was eluted using a fission-based  $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$  generator that was created locally, and imaging was done using single-photon emission computed tomography (SPECT). The quality control experiments suggest that Moxifloxacin-loaded chitosan nanoparticles with technetium-99m had labeling effectiveness of more than 75%. Radiochemical yield was examined using instant thin layer chromatography (ITLC) methods. On the basis of the observed findings, it can be inferred that the newly created  $^{99\text{m}}\text{Tc}$ -moxifloxacin chitosan nanoparticles could be employed as an effective diagnostic agent for deep-seated bacterial infections.

*Keywords – Radiopharmaceutical, moxifloxacin-chitosan nanoparticles, technetium-99m, SPECT and ITLC*

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## Application Of Vegetable Oils In The Field Of Food Packaging

Hamour Noura, Boukerrrou Amar

*Laboratoire des Matériaux Polymères Avancés (LMPA), Faculté de Technologie, Université de Bejaia, 06000 Bejaia, Algérie*

*nherroudj@yahoo.fr*

**Abstract** – Essential oils and extracts from aromatic and medicinal plants have been extensively researched not only for being natural products, but also because they have been shown to have biological properties, nutritional and health benefits for food and humans. They have been widely studied and exploited because of their biological properties. In general, the major bioactive components present in essential oils and extracts are mainly responsible for their biological activities, but minor compounds may also contribute and may show synergistic activity. A wide variety of essential oils and extracts from different aromatic plants have been applied in the manufacture of food packaging. These substances have been applied to low cost non-biodegradable polymers and biopolymers with complex processing. In this study we used poly lactic acid and polyhydroxyalkanoate as polymeric matrices and as active substances the essential oils of thyme and pistachio, which are traditionally known for their therapeutic effects and their antimicrobial, antibacterial and nutritional properties.

*Keywords – Biopolymer, Essential oils, Packagin, Mechanical properties.*

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## Real Time Ultrasoft Transverse Gluons Self Energy At Next To-Leading Order In Hot QCD

Karima Bouakaz, Abdessamad Abada

*Department of Physics, Laboratoire de Physique des Particules et de Physique Statistique, ENS-Kouba, Algeria  
Department of Physics, United Arab Emirates University, P. O. B. 17551, Al Ain, United Arab Emirates*

*karbouakaz@gmail.com*

**Abstract** – We determine a compact analytic expression for the complete next-to-leading contribution to the retarded transverse gluons self-energy in the context of hard-thermal-loop summed perturbation of massless quantum chromodynamics (QCD) at high temperature to calculate the next-to-leading order dispersion relations for slow-moving transverse gluons at high temperature quantum chromodynamics, using the real time formalism (RTF) in physical representation. We derive the analytic expressions of hard thermal loop (HTL) contributions to propagators and vertices to determine the expressions of the effective propagators and vertices in RTF that contribute to the complete next-to leading order contribution of retarded scalars self-energy.

*Keywords* – *Effective expansion, QCD, NLO Computations, Resummation, Thermal field theory*

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## Impedance Spectroscopy And Dielectric Properties Of PZT-Based Ceramics

Messai Bahia, Makhloufi Rachid and Benmakhlouf Aymen

Laboratory of Applied Chemistry (LCA), University of Biskra, P.O. Box 145, 07000, Biskra, Algeria.

[bahia.messai@univ-biskra.dz](mailto:bahia.messai@univ-biskra.dz)

**Abstract** – Ferroelectric ceramics of type PZT of general formulation  $\text{Pb}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$  are widely used in many technological fields due to their dielectric and electromechanical properties. It is possible to modulate these properties and obtain specific characteristics for precise applications by performing cationic and/or anionic substitutions in the crystalline network of the PZT base material of perovskite structure.

The object of this study is the search for ceramics of the PZT type near the morphotropic phase boundary (MPB) with stable and reproducible characteristics. A series of composition  $\text{Pb}_{1-x}\text{Sr}_x(\text{Zr}_{0.52}\text{Ti}_{0.43}(\text{Al}_{0.5}, \text{Sb}_{0.5})_{0.05})\text{O}_3$  with  $x=0, 0.02, 0.04, 0.06, 0.08$  and  $0.1$  were prepared using the conventional synthesis method known as ceramic at temperatures above  $1000^\circ\text{C}$ . The nature of the phases obtained was verified by X-ray powder diffraction. For dielectric measurements, the powders are compacted and then sintered at temperatures between  $1200$  and  $1250^\circ\text{C}$ . The texture (porosity and grain size) of the sintered material was observed by SEM, Dielectric properties and the impedance spectroscopy were used to investigate several characteristics of our samples.

*Keywords* –PZT; impedance; Dielectric properties; SEM; XRD; SEM.

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## High Antioxidant Capacities and Anti-inflammatory Effects of *Hammada Elegans* Botsch. Extracts: An in vitro Assessment

Bensafiddine Feriha, Asseli Ibrahim, Djeridane Ammar, Yousfi Mohamed

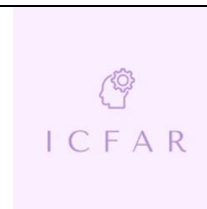
*Laboratoire des sciences fondamentales, Université Amar Telidji. PB 37G, 03000, Laghouat- Algérie.  
Plateau technique d'analyse physico-chimique, Université Amar Telidji. El khneg, 03000, Laghouat- Algérie.  
Laboratoire des sciences chimiques et physiques appliquées, ENS de Laghouat, BP 403, Laghouat-Algérie.*

*farahbensafi@gmail.com*

**Abstract** – Plants supply traditional Algerian medicines for the treatment of antiinflammatory effect. The reasons for the use of traditional treatment were that pure compound obtained were also effective in reducing the toxicities of toxic agents or other drugs. In this study, we explore the phytochemical composition and the phenolic content by indirect method to evaluate the antioxidants and the anti-inflammatory capacities of twelve extracts from three plants. The total phenolic content ranged from  $0.168 \pm 0.020$  to  $4.166 \pm 0.124$  mg per gram of dry weight. Phytochemical screening revealed that tannins, C-heterosides, O-reduced heterosides and reducing compounds are the most common chemical groups. The highest antiradical activity was achieved with methanolic extract of *Hammada elegans* ( $EC_{50} = 0.551 \pm 0.171$  mg/mL). However, the acetonc extract of *Hammada elegans* represents the most important reducing activity ( $EC_{50} = 0.747 \pm 0.004$  mg/mL). Moreover, this extract also displays the highest chelating ferrous ions effect ( $EC_{50} = 5.749 \pm 0.009$  mg/mL) while the hydromethanolic extract of *Cleome arabica* has the best antilipoperoxidative effect ( $EC_{50} = 0.031 \pm 0.000$  mg/mL). Furthermore, all extracts inhibit the activity of lipooxygenase and cyclooxygenase with  $IC_{50}$  values less than  $19.210 \pm 0.297$  mg/mL. Therefore, the acetonc extract of *Hammada elegans* appears to be twice greater than that of standard inhibitors. The fractionation of the acetonc extract of *Hammada elegans* has given a potent bioactive compound which seems to have potential therapeutic possibilities for the prevention of the inflammatory effects.

**Keywords** – Anti-inflammatory effect, antioxidant capacity, *Hammada elegans*, isolation, phytochemical screening.

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## Synthesis And Antibacterial Activity Of Novel Quinoline-Oxirane Hybrids

Bouria Houria, Alliouche Hayette, Oulmi Lamia, Belafaitah Ali

*Equipe de Synthèse de Molécules à Objectif Thérapeutique (SMOTH), Laboratoire des Produits Naturels d'Origine Végétale et de Synthèse Organique. Faculté des Sciences Exactes, Campus de Chaabat Ersas, Université Frères Mentouri-Constantine I. Constantine 25000, Algeria*

*Biotechnologie et Valorisation des Ecosystèmes Extrêmes, Laboratoire de Génie Microbiologique et Applications. Faculté des Sciences de la Nature et de la Vie, Campus de Chaabat Ersas, Université Frères Mentouri-Constantine I. Constantine 25000, Algeria*

*bouriahouria@gmail.com*

**Abstract**– A series of novel quinoline-oxirane hybrids were synthesized in high yields via the epoxidation of quinoline-cyanoacrylonitrile derivatives under mild conditions, and their molecular structures were confirmed using conventional spectroscopic methods. The synthesized compounds have been tested for their potential as antibacterial agents against *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus spizizenii*, and *Staphylococcus aureus*. Most of the compounds showed good antibacterial activity, particularly against *Bacillus spizizenii*, and *Staphylococcus aureus* microorganisms.

*Keywords* – *Quinoline, oxirane, hybrids, epoxidation, antibacterial activity.*

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## Estimate Of The Liquid Discharge And Solid Yield Of a Semi Arid Climate In The Northeast Algeria (Elk'Sob Watershed Cas Study)

BADJI AMINA, MAROUF NADHIR and KECHIDA SAID

*Laboratory of Soils and Hydraulic, Badji Mokhtar Annaba University*

*Address: P.O. Box 12, 23000, Annaba, Algeria*

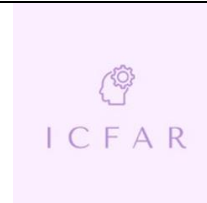
*Hydraulic Research Laboratory, University of Ben M'Hidi Oum-El-Bouaghi, Algeria*

*amina1badji@gmail.com*

**Abstract** – the siltation of dams is a natural outcome of basin degradation brought on by soil erosion and the movement of solid waste, particularly after heavy rains; it is perplexing currently because the public operators have a large population, which is a necessity for maintaining the water supply in existence. This phenomenon is viewed as catastrophic for ecosystems, biodiversity, and the people (inondations, pollutions). The importance of the quantitative and qualitative aspects of sediment transport which stimulate the consequences of water erosion in the Algeria Northeast is dramatic. In this paper presents the statistical study and evaluate solid yield and liquid discharge values, it is based on the instantaneous values of concentrations (C) and liquid flows ( $Q_L$ ) measured by the National Water Resources Agency (ANRH) during the period 1973 to 1992 in the semi-arid zone of Oued ELK'SOB watershed (1480 km<sup>2</sup>) in the Northeast Algeria .Using the larcgis software to validate the data, delimitation of the watershed and to study the land use .The maximum values of the contributions of the catchment area of oued EL K'SOB are recorded in March 1985 and in October 1991. This variability is caused by high spring flows and fierce fall storms after the long dry summer.

*Keywords – liquid discharge; solid yield; ArcGIS; semi-arid; watershed*

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## On a Class of Sequential Fractional Differential Equations

Ahlem Adoui, Rabah Khaldi and Assia Guezane-Lakoud

*Department of Mathematics/Faculty of Sciences, University of Badji Mokhtar-Annaba, Algeria*

*Department of Mathematics/Faculty of Sciences, University of Badji Mokhtar-Annaba, Algeria*

*Department of Mathematics/Faculty of Sciences, University of Badji Mokhtar-Annaba, Algeria*

*adouiahlem13@gmail.com*

**Abstract** – The primary focus of this talk is to study a fractional initial value problem involving a Riemann-Liouville sequential fractional derivative. Our approach relies on transforming the problem at hand into a fixed point problem. Then, using a fixed point theorem for partially ordered sets we develop sufficient conditions on the nonlinear term that ensure the existence of solutions in a weighted space of continuous functions.

*Keywords* – Fractional Differential Equations, Sequential Fractional Derivatives, Upper and Lower Solutions, Monotone Iterative Method

---

## CORMIX Simulations of Surface Brine Discharges: A Case Study

Abdelghani BOUTHIBA , Mourad AMITOUCHE and Hacem MAHMOUDI

*Laboratory of Chemistry Vegetable-Water-Energy, Department of Hydraulic, University of Hassiba Benbouali Algeria*  
*Laboratory of food technology research, Boumerdes University 3500 Algeria*  
*University of Hassiba Benbouali Algeria*  
*\* ad.bouthiba@univ-chlef.dz*

**Abstract** – The demographic increase and the deficit of the drinking water resources push the countries to count on the desalination of the sea water this procedure caused important volumes of hyper saline rejection in the sea what translates by an environmental imbalance of marine environment.

The Mainis station, located in Algeria, with a brine discharge rate of approximately 253,152 m<sup>3</sup>/d. The brine is discharged directly into the marine environment through an outfall, A remarkable (considerable) increase in salinity, which sometimes exceeds 43 g/, has been noted at coastline after a distance of 300 m from the discharge point.

In this present work we are going to highlight the functioning of the diffuser of the desalination plant of Algeria (Ténes) and to test its reaction during the changes of the climatic parameters, In addition, we have made modifications on this diffuser to improve its performance of dilution of brine, and this by running simulations of different scenario of the trajectories of brine discharges into the receiving environment (the sea), through a modeling study under different hydrodynamic conditions like wind speed and direction and current using a CORMIX code (Cornell Mixing Expert System), From simulation results obtained under worst case conditions. modifications to the system were recommended to improve its efficiency even under unfavorable conditions, It was suggested to increase the distance between the diffuser ports and to move it to a deeper position (8m), Based on simulations, the dilution results were very satisfactory, with the excess concentration decreasing from 7 g/L to 1.8 g/L after 300m from the discharge.

*Keywords – desalination, Algeria, Mainis, brine, impacts, environment, diffuser, sea, Cormix.*

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## Estimation Of The Compressive Strength Of Self-Compacting Concrete Using Neural Networks

Serikma Mourad and Mezidi Amar

*Laboratory of Acoustic and Civil Engineering LAGC; University of Abdeahmane Mira de Béjaia, Algéria*

*Laboratory of Acoustic and Civil Engineering LAGC, Faculty of Sciences and Technology, University of Djillali Bounaama  
Khemis Miliana, Algeria.*

*aomez2009@gmail.com*

**Abstract** – The present work constitutes a contribution to the research aiming at the methods of the estimation of the compressive strength of the self-compacting concretes (SCC). These new concretes lack specific methods of formulation like the ordinary concretes. The development of a formulation is much more complex with the introduction of new constituents such as chemical additives and mineral additions on the one hand; and the widening of the range of properties of use of materials based on workability and strength.

The main objective of this study is to maintain the reliability of neural networks; with the development of a model capable of predicting the values of compressive strength of each mixture of self-compacting concrete, without going through the calculation regulations based on very complex numerical methods, using a statistical approach based on the concept of artificial neural networks (ANN). For this purpose, a database from previous research projects is used to create the best network linking the strength characteristics under six inputs such as the amount of gravel, sand, cement, water, filler and superplasticizer to determine single output strength at 28 days. In general, the approach presented here can lead to a more accurate and faster determination of the compressive strength of self-compacting concrete.

*Keywords – self-compacting concrete, formulation, neural networks (ANN), Resistance, Workability.*

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## Numerical Study of air Flow Features Induced by a Room Ceiling-fan

Lyes Nasserri, Zouhira Hireche, Ammar Zeghloul , and Djamel Eddine Ameziani

*Laboratory of Multiphase Flows and Porous Media, University of Sciences and Technology Houari Boumediene, FGMGP, BP  
32 El Alia 16111 Bab Ezzouar, Algiers, Algeria  
National Polytechnic School, BP 182, El Harrach, 16200, Algiers, Algeria*

[lyes.nasserri@usthb.edu.dz](mailto:lyes.nasserri@usthb.edu.dz)

**Abstract** – The convection induced by both the temperature gradient and inertial source within square enclosure has been studied. The natural convection effect is attained by temperature gradient between left and right wall (hot and cold, respectively). A ceiling fan stirs the fluid flow in the cavity to cool it. In order to investigate the effect of fan location, three different placements of fan are considered. The study has been carried out by solving numerically momentum and energy equations using the finite volume approach, with SIMPLER algorithm on the collocated arrangement. The study has been carried out for the Reynolds number in the range of  $50 \leq Re \leq 1000$ , with Rayleigh numbers  $10 \leq Ra \leq 106$  for different fan position HF, while Prandtl number is kept at 0.71. Results are presented in the form of streamlines, isotherms, and average Nusselt number. The results show that the average Nusselt number increases with increasing in Reynolds number, especially for eccentric position.

*Keywords – ceiling fan, mixed Convection, ventilated cavity, momentum generation*

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## Assessing the Impact of Key Performance Indicators on Moroccan Forests: A GIS and BI Analysis of the Tangier Province

Soukaina BAHMANE

*ERMIA, University Abdelmalek Essaadi, Morocco*

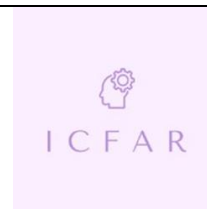
*bahmane.soukaina@gmail.com*

**Abstract** – Forests play an important role in the ecological and economic well-being of Morocco. However, they have been facing various challenges in the past decades due to a variety of reasons. This includes the expansion of agriculture, the increasing demand for wood, the fragmentation of the forest, the desertification of the forest, and fires. Unfortunately, these factors have led to a massive shortage on the forest coverage and its degradation.

This article aims to investigate the impact of various key performance indicators (KPIs) on the state of Moroccan forests, with a focus on the forests of the Tangier province. Utilizing Geographic Information System (GIS) and Business Intelligence (BI) technologies, the study will analyze and visualize changes in the forest over the last decade. By utilizing GIS and BI, detailed maps and visualizations will be created, highlighting changes in KPIs such as forest area, tree density, species diversity, and carbon sequestration. The study will also identify key areas in need of conservation efforts and provide recommendations for improving the health of Moroccan forests. This research will be useful for policymakers, researchers, and other stakeholders involved in the conservation of Moroccan forests.

*Keywords – Forest, Morocco, KPIs, GIS, BI*

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## An innovative Nanoparticle For Preparing Pyrano[3,2-b]Pyrone Derivatives Via a One-Pot Process

CHELIHI Ahmed, HASSAINE Ridha, BENABDALLAH Mohammed, BENDAHOU Karima, NACHET  
Souad, TAIBI Nadia, CHOUKCHOU-BRAHAM Nouredine

*Laboratoire de Catalyse et Synthèse en Chimie Organique, Faculté des Sciences, Université de Tlemcen, BP 119, 13000,  
Tlemcen, Algeria*

*Centre de Recherche Scientifique et Technique en Analyses Physico-Chimiques CRAPC, Bou-Ismaïl, BP 384, 42004 Tipaza,  
Algérie.*

*[ahmed.chelihi@univ-tlemcen.dz](mailto:ahmed.chelihi@univ-tlemcen.dz)*

**Abstract** - Pyrano[b]pyrones are an important class of heterocyclic compound containing fused 4H-pyrans rings that are a structural constituent of many natural, non-natural, drug candidates, synthetic compounds and play a significant role in the field of medicinal and pharmaceutical chemistry because of their wide-ranging[1].

Since antiquity, pyrano[b]pyrones derivatives have developed remarkably in terms of strategy in chemical synthesis, from which operating modes have been used under optimal conditions with heterogeneous catalysts while respecting the environment[2].

On the other hand, several studies have evaluated these derivatives and have proven potentially active in medicine[3].

This present work describes a study on the potential molecular fluorescence that has been implemented for a range of pyrano[b]pyrones already prepared via a process of multicomponent reaction in the presence of a new catalyst based on magnesium oxide supported on SBA-15 (MgO/SBA-15) between the aromatic aldehyde, the malononitrile, and the 4-hydroxycoumarin.

**Keywords:** *pyrano[b]pyrones, heterogeneous catalysts, MgO/SBA-15, medicinal activity, multicomponent reaction.*



## Production and Characterization of Hydroxyapatite Nano powders prepared by Using Different Calcium Precursors

M. Mokhtari, A. Ziouche, H. Braa and H. Elmesellem

*University of Larbi Ben M'hidi, Oum El-Bouaghi, Algeria*

*Research Center in Industrial Technologies (CRTI), P.O. Box 64, Cheraga, 16014 Algiers, Algeria*

*Department of Pharmaceutical Sciences, College of Pharmacy and Health Sciences, Ajman, UAE*

*Laboratory of Analytical Chemistry, Materials and Environment (LC2AME), Faculty of Sciences, University of Mohammed Premier, B.P. 717 60000 Oujda, Morocco.*

*madjda.mokhtari@yahoofr*

**Abstract** – Calcium phosphate, hydroxyapatite, bioactive glass, alumina, and TiO<sub>2</sub>, are biomaterials that have been utilized as a tissue engineering scaffolds for the repair, reconstruction, and replacement of deformed parts of the body over the past years. These listed materials include Hydroxyapatite (HA: chemical formula Ca<sub>5</sub>(PO<sub>4</sub>)<sub>3</sub>OH), that is bioceramic used in different biomedical applications like matrices for drug release control and bone tissue engineering materials.

Synthetic HA has received many attentions as a replacing teeth or bones. Also, it demonstrates great biocompatibility with hard tissues, skins, and muscle tissues because it shows biodegradability in situ, good osteoconductive and osteoinductive capabilities and it can bond to bone structure easily thanks to its similar chemical structure to the inorganic component of bone matrix. But HA powder has low reliability with wet environments.

There are several methods using to produce synthetic HA, In this study, HA powders was successfully synthesized by the wet chemical precipitation technique for bone tissue engineering using calcium nitrate tetrahydrate [Ca(NO<sub>3</sub>)<sub>2</sub>·4H<sub>2</sub>O], calcium chloride dihydrate (CaCl<sub>2</sub>·2H<sub>2</sub>O), calcium hydroxide [Ca(OH)<sub>2</sub>] and disodium hydrogen phosphate (Na<sub>2</sub>HPO<sub>4</sub>·12H<sub>2</sub>O) as calcium and phosphate ion sources, respectively.

Structures of synthesized powders have been examined by X-ray diffraction and powders morphology is determined using scanning electron microscopy. X-ray powder diffraction confirms the effect of calcination on the crystallinity of as prepared HA. The effect of different precursors affects the obtained morphologies. Furthermore, varying the combination between ions recourse could be enhanced HA properties.

*Keywords* – Biomaterial; Ca<sub>5</sub>(PO<sub>4</sub>)<sub>3</sub>OH; HA; Nano powders; calcium precursors.

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## Study Of The Finite-Mass Effects On Some Response Functions For The System Of The Hadronic Gas-Quark Gluon Plasma Phases Coexisting In A Finite Volume

Rokaya Djida, Amal Ait El Djoudi, Hafida Ghobrini and Houda Mebdoua

*Laboratoire de Physique des Particules et Physique Statistique, Ecole Normale Supérieure-Kouba, B.P. 92, 16050, Algiers, Algeria*

*rokaya.djida@g.ens-kouba.dz*

**Abstract** – To investigate the thermally driven QCD Deconfining Phase Transition (DPT), from a hadronic gas phase to a Quark Gluon Plasma (QGP), in a finite volume at zero chemical potential, we adopted the idea of examining thermodynamic quantities called response functions which give a concise description of the DPT. We dealt with the order parameter of the DPT, its first thermal derivative which represents the susceptibility and the second cumulant of the probability distribution representing the variance. For the study of the finite-mass effects, we illustrate the variations of the previous quantities in the case of massless particles and in the case where massive particles are included. These mean values are calculated using the QGP color-singlet partition function obtained within the projection method. The such obtained results are translated into graphs, with varying temperature and for different volumes of the mixed system. We notice, in addition to the similarity between the behavior of the thermal susceptibility and the behavior of the second cumulant of the probability distribution representing the variance, that the transition temperature is lowered in the case of considering massive particles in the system.

*Keywords* – Deconfinement, phase transition in QCD, color singletness, response functions.

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## Studying the Thermal Comfort of Displacement Ventilation in a Room : Inlet-Outlet Location Effect

Zouhira Hireche, Lyes Nasserri, and Ammar Zeghloul

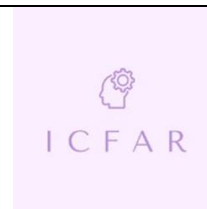
Laboratory of Multiphase Flows and Porous Media, University of Sciences and Technology Houari Boumediene, FGMGP, BP  
32 El Alia 16111 Bab Ezzouar, Algiers, Algeria  
National Polytechnic School, BP 182, El Harrach, 16200, Algiers, Algeria

[lyes.nasserri@usthb.edu.dz](mailto:lyes.nasserri@usthb.edu.dz)

**Abstract** – This paper analyses a numerical study on the heat transfer phenomenon by convection in a ventilated square cavity. Two configurations have been considered: in the first one, the hot wall is the left one, and in the second configuration is the right one. For both cases, the other walls are considered insulated. To solve this problem, Lattice Boltzmann method on multi-relaxation time (LBM-MRT) has been chose to resolve governing equations. The numerical simulations were performed in the laminar regime, for values of Reynolds number,  $Re$ , [20-500] and Rayleigh number,  $Ra$ , [10-10<sup>6</sup>] with Prandtl number  $Pr = 0.7$ . It was the main purpose of the paper to draw attention to flow structure, the isotherms, the evolution of the average Nusselt number in forced convection mode as a function of  $Ra$  and  $Re$ , as well as the average temperature, allowed us to establish correlations of the average temperature and the heat transfer rate as a function of the Reynolds number, for the two configurations. A comparison of the two cases results was made to deduce the conditions that provide the best thermal comfort inside the cavity.

*Keywords – Forced convection; mixed convection; ventilated cavity; Lattice Boltzmann method; MRT method*

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## Encapsulation Of Essential Oils Natural Allelochemicals Compounds As Bio Herbicides Products.- A Review

Soltane Sabrina , Benmeddour Tarek

*Department of Nature and Life Sciences, /Laboratory of Genetic, Biotechnology and Valorization of  
Bioresources, University of Biskra, P. O. BOX 145 RP, 07000, Biskra, Algeria.  
Department of Nature and Life Sciences, /Laboratory of Genetic, Biotechnology and Valorization of  
Bioresources, University of Biskra, P. O. BOX 145 RP, 07000, Biskra, Algeria.*

*sabrine.soltane@univ-biskra.dz*

**Abstract** – Weed control using chemical herbicides is an expensive practice in conventional agriculture ; that use have a negative effect and has enhanced environmental pollution, human health problem and weed resistance becoming dominant. Allelopathy permits sustainable weed management while reducing the impact of agriculture on the environment. The potential use of essential-oils (EOs) as a bioactive (allelochemicals) present in plants may help to develop new natural herbicides.

Different plant metabolites, essential oils are a chemical compounds that are sensitives to light, thermal conditions and oxidation. To overcome these problems encapsulation is a well-established technique for the preservation . This review describes the potential allelochemicals of plants nano-encapsulated and investigated for their herbicidal activities.

*Keywords – Weed, Essential Oils (EOs), Allelochemicals, Encapsulation, Bioherbicide, Sustainable agriculture, Eco-friendly.*

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## The traditional control of Brushless Doubly-Fed Reluctance Machines

Oualah Oussama, Kerdoun Djallel and Boumassata Abderraouf

*LGEC Research Laboratory, Department of Electrical Engineering, Brothers Mentouri University Constantine 1, Constantine, Algeria*

*National Polytechnic School Constantine, Algeria*

[oussama.oulha@umc.edu.dz](mailto:oussama.oulha@umc.edu.dz)

[kerdoun.djallel@umc.edu.dz](mailto:kerdoun.djallel@umc.edu.dz)

[a\\_boumassata@umc.edu.dz](mailto:a_boumassata@umc.edu.dz)

**Abstract** –The conventional reluctance machine is poor in performance. Researchers have tried to improve it and have come out with a brushless doubly fed reluctance machine (BDFRM) which can run as a motor or generator. This machine is an attractive alternative in variable speed drives and wind power generation. The paper is concerned with flux and voltage vector-oriented control of a promising brushless doubly-fed reluctance machine (BDFRM) for generator and drive systems with limited adjustable speed ranges (e.g. wind turbines and/or pump drives).

*Keywords* –*Vector Control (VC), Brushless Doubly Fed Reluctance Machine (BDFRM).*

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## Effect Of Recycled Sand And Fines Retained From Eggshell Waste On The Fresh And Hardened Properties And Durability Of SCC And SFSCC

Chaib Sihem, Bensalem Rania

*Laboratoire de La Mécanique des Sols et des Structures (LMSS), Université des Frères Mentouri, Constantine1, Algeria  
Université des Frères Mentouri, Constantine1, Algeria*

*chaib.sihem@umc.edu.dz;  
[sihem.chaib@yahoo.fr](mailto:sihem.chaib@yahoo.fr)*

**Abstract** – This scientific research was carried out within the framework of contributing to the recovery different natures of waste, and to make it possible to minimize using of natural aggregates in the field of construction, in order to place an eco-self-consolidating concrete (eco-SCC). Crushed demolition waste mainly that of concrete had been studied as a substitute for natural sand. As well as the effect of replacing fines with crushed eggshell waste was assessed. So this present work fits in these contexts. Therefore the main objective of this study is to improve current knowledge on the behavior of studied concretes in fresh state: slump-flow test, and hardened state: mechanical resistances in compression and in bending, as well as water absorption by capillarity test, absorption by total immersion, and porosity accessible to water of SCCs designed from different types of waste, recycled sand and eggshell fines. It was also investigated how the assessed mixes were affected by the sort of chemical attack, namely the (NaCl) attack. In the light of the obtained results, it was found that the addition of eggshell fines in adequate quantity, can improve the properties of SCCs, in this study a volume of 30% was sufficient, increasing the volume added to 60% introduced an opposite effect. Using recycled sand in this study did not contribute to a significant effect on the mechanical properties of the mixtures studied, although an improvement in workability was observed.

*Keywords – Self-consolidating concrete (SCC), eggshell fines, recycled sand, steel fibers, fresh state, mechanical characteristics, and durability*

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## **Eco-Sustainability and Green Metrics for Measuring the Big Data Systems Performance**

Yusmadi Yah Jusoh, Aishwharya Raani Arunachalam, Rusli Abdullah, Rozi Nor Haizan Nor and Shireen Muhammad

<sup>1,2,3,4</sup>*Department/ of Software Engineering and Information Systems, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia (UPM), Serdang, Selangor, Malaysia*

<sup>5</sup>*Faculty of Communication, Visual Art and Computing, Universiti Selangor (UNISEL), Selangor, Malaysia*

*yusmadi@upm.edu.my*

**Abstract** –The increasing growth of data size and speed requirements requires the need for performance measurement on big data systems (BDS). It is proven that measuring the BDS process will contribute to the efficiency and effectiveness of an action or a process. Enhancement in the performance of BDS is among the efforts to ensure organizations optimize their benefits in attaining profitability. However, most BDS are doomed to failure and one of the major causes is a lack of knowledge in measuring the performance of BDS. A literature study was conducted to identify the performance measurements for BDS by considering eco-sustainability and green perspectives. The aim is to propose eco-sustainability and green metrics to sustain the performance of BDS. The initial proposed model is significant in helping organizations to achieve their objectives and vital transmission in sustaining their performance. It is believed that measuring the BDS using green metrics would have good potential in sustaining the performance of BDA processes which could cater to one of the highest demands which are to have a green environment. Understanding the metrics that contribute to the performance of the BDS are important and significant for future improvements.

*Keywords – Green Metrics, Eco-Sustainability Metrics, Performance, Big Data Systems, Sustainability*

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## Identification Of A Photo-Degradation By-Products Of a Organophosphorus Pesticide At Trace Level

ZEKKAOUI Chemseddine, BERRAMA Tarek, DADOU Salima, BERIBER Assia, DOUFENE Nassime,  
Kadmi Yassine

*Laboratoire des sciences du génie des procédés industriels, Université des Sciences et de la Technologie Houari  
Boumediene, BP 32, El-Alia, 16111, Bab-Ezzouar, Alger, Algérie*

*Laboratoire de spectrochimie infrarouge et Raman (LASIR), UMR-CNRS 8516, Université des sciences et  
technologies de Lille, France*

*ch.zekkaoui@gmail.com*

**ABSTRACT** - The aims of this study is the identification of the by-products resulting from the degradation of an organophosphorus pesticide (Diazinon) using the photo-Fenton process. The initial concentration of this pollutant was set at 1 mg.L<sup>-1</sup> as an approach to the real case. A new concept based on the coupling of the two techniques was employed to identify the by-products of this degradation:

- i) QUEChERS extraction (quick, easy, cheap, effective, rugged, and safe) (Liq/Liq extraction technique) dispersive solid phase extraction (d-SPE) was performed. The extraction followed a well-defined protocol based on the principle of d-SPE extraction with an organic solvent in the presence of salts and tampons to ensure the transformation of the molecules in the effluent to the organic phase. The extract was evaporated (pre-concentration method) under a high-purity nitrogen stream.
- ii) GC-MS/MS (gas phase chromatography coupled with a triple quadrupole mass spectrometry) was used for the identification of by -products resulting from the photo-degradation of Diazinon.

The GC-MS/MS analysis method combined with the QuEChERS extraction approach and the pre-concentration method showed excellent performance in detecting by-products even at concentrations on the order of ng.L<sup>-1</sup>. Six by-products were identifier in this work: diazoxon, triethyl phosphate, triethyl thiophosphate, 2-isopropyl-5-ethyl-6-methylpyrimidine-4-ol, 2-isopropyl-6-methylpyrimidine-4-ol (IMP) and hydroxydiazinon. This methodology could be used to detect pesticides (at trace levels) and their by-products in waters at very low concentrations (at ultra-trace levels).

**Keywords:** GC-MS/MS, QUEChERS extraction, Pesticide, photo-Fenton degradation, By-products identification.

## Carbon Footprint of Desalination Plants in Algeria

Baloul Hakim, Amitouche Mourad

<sup>1</sup>LRTA Boumerdes University, Boumerdes 35000 Algeria

<sup>2</sup>LRTA Boumerdes University, Boumerdes 35000 Algeria

*h.baloul@univ-boumerdes.dz*

**Abstract** – Current figures indicate that there are about 16,000 desalination plants in the world producing about 95 million m<sup>3</sup> of desalinated water and 142 million m<sup>3</sup> of discharge every day with different technologies. The production of water by desalination of Seawater is actively developing in several areas in the world including the Mediterranean coasts by about 47.5% of world production.

Several desalination techniques exist although reverse osmosis (RO) is the most widely used in the world due to its energy efficiency and low cost of producing fresh water.

Algeria has 11 large operational desalination stations spread over a coastline of 1200 km, with a total capacity of approximately 2.1 million m<sup>3</sup> of desalinated water and a discharge that exceeds 2.4 million m<sup>3</sup> per day. The technology used in 10/11 plants is reverse osmosis, with the exception of the Kahrama station in Oran with the MSF technique.

As the population and demand for water grows, there is a growing need for alternative water supplies from water desalination systems. These systems are beneficial for water augmentation; however, there are concerns related to their carbon footprint. Reverse osmosis (RO) technologies have been found to have lower CO<sub>2</sub> emissions than thermal desalination technologies and the carbon footprint of reverse osmosis seawater desalination (0.4 to 6.7 kg CO<sub>2</sub>eq/m<sup>3</sup>) is generally greater than brackish water desalination by reverse osmosis (0.4–2.5 kg CO<sub>2</sub>eq/m<sup>3</sup>). This document presents the formatting instructions for the Proceedings of the International Conference on Applied Engineering and Natural Sciences.

*Keywords – desalination, RO, impacts, environment, footprint, carbon dioxide, Algeria.*

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## An AI-based Android Application For Early Diagnosis of Ocular Diseases

Abdul Malik Muhammad , Muddasir Hussain Tayaba Naz and Faraz Akram

*Biomedical, Riphah International University, Pakistan*

*Biomedical, Riphah International University, Pakistan*

*Biomedical, Foundation University School of Science and Technology, Pakistan*

*Biomedical, Riphah International University, Pakistan*

*muddasir\_right@hotmail.com*

**Abstract** – Human eye is the main sensory organ for the vision that gives visual information to the brain. Any disorder or disease in the human eye may interrupt the path of visual information which may range from mild to moderate conditions or may cause vision impairment. Many eye conditions, including cataracts, conjunctivitis, and others can impair vision. Inadequate ocular disease identification is the main factor in human vision impairment. Early ocular disease detection makes a significant contribution to the control or recovery of visual impairment in people. The only way to successfully limit the advancement of these eye diseases is by early diagnosis. Artificial Intelligence (AI) can help ophthalmologists in these situations to make an accurate and early diagnosis through recently developed technologies in AI, like deep convolutional neural networks (DCNN), which are highly significant in image classification. In this study, the different approaches which include classic ensemble learning machine learning, transfer learning, and deep learning have been evaluated by training and testing on a dataset of ocular images taken by a smartphone camera. The best model has been chosen to use in an Android application, by either taking a real-time photograph of an eye or selecting a photo from the smartphone gallery. The android application distinguished and label the ocular image as infected or healthy. This Ai based android application is a breakthrough in the early diagnosis of eye disease which saves the user time cost-effectively. It enables accurate remote diagnosis which in turn also lessens the burden on ophthalmologists.

*Keywords – Deep Convolutional Neural Network, Image Classification, Cataracts detection, Conjunctivitis, Ensemble Learning, Tensor-Flow Mobile, Deep Feature Extraction*

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## **Application of the 2-D Continuous Wavelet Transform using Directional Wavelet**

Kenza Zaibak, Nora Nait Bouda, Fawzia Mekideche-Chafa

Department of Physics, Ecole Normale Supérieure, BP 92 Vieux Kouba, 16050 Alger, Algeria  
Department of Theoretical Physics, Faculty of Physics, University of Sciences and Technology Houari Boumediene, Algiers,  
Algeria

Department of Energetic and Fluid Mechanics, Faculty of Physics, University of Sciences and Technology Houari  
Boumediene, Algiers, Algeria

[kzaibak2@gmail.com](mailto:kzaibak2@gmail.com)

**Abstract** – The continuous wavelet transform has emerged as a powerful time–frequency analysis for the interrogation of complex nonstationary signals. It found applications to practically all domains, of physics, applied mathematics and engineering. Many 2D wavelets mother have been proposed and designed for specific problems, such as the Gaussian, Mexican hat and Morlet Wavelets. The choice of the appropriate wavelet mother depends on the type of information that we want to extract from the signal. In this work, we describe the basic concept of two dimensional 2D wavelet transform (CWT), then we apply the CWT to the analysis various images using the directional Wavelet.

*Keywords* – *Continuous wavelet transform, Morlet wavelet, Mexican hat wavele.*

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## Automated Model-Based Test Case Generation Using Uml Activity Diagram: A Review

Rozi Nor Haizan, Mohd Abdul, Monim, and Yusmadi Yah , Jusoh

*Department of Software Engineering and Information System,  
Faculty of Computer Science and Information Technology,  
Universiti Putra Malaysia, Serdang, Selangor, Malaysia*

[rozinor@upm.edu.my](mailto:rozinor@upm.edu.my)  
[shimunlick@gmail.com](mailto:shimunlick@gmail.com)  
[yusmadi@upm.edu.my](mailto:yusmadi@upm.edu.my)

**Abstract-** Software or application testing is a process of executing a program with the goal of finding defect to make better system. In software testing phase, writing test cases is one of the important activities. Manually writing test cases approach is lengthy of time period and need more effort to accomplish the process. This paper describes test case, test case generation techniques, different types of software testing approaches and comparison of testing tool. Test cases usually writing at the beginning of testing process from the set of software requirements. Test cases are created by using two different approaches. One is manually written test cases and another is automatically generated test cases. Manually written test cases are a very lengthy process and need to give a lot of effort to make good quality test cases. On the other hand, automatically generated test cases are generated by automatically using some software tools and it saves a lot of time and effort.

*Keywords: Test Case Generation, Testing Technique, Model Based Testing, Automated Test Case Generation, UML Diagram.*

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## Development of TQI- RI Correlation on Track Degradation Technique Using Numerical Method

Shanmugasekar Thenappan and Azlan Adnan

*Department of Civil Engineering, University Teknologi Malaysia (UTM), Malaysia*

*shanmugasekar@gmail.com*

**Abstract** – The heavy axle loads of trains, frequently combined with high velocities, inevitably cause a deterioration of the track geometry. Track maintenance expenses represent a significant percentage of total railway infrastructure expenses. The usage of accurate techniques is necessary to predict track conditions increases track safety passengers' comfort and maintenance effectiveness. This paper provides a developed combined degradation model relevant to railroad tracks. The comprehensive field track data that were collected from Malaysian main line meter gauge network were used to derive the degradation model. A field data based on geometry perspectives relies on the Track Quality Index (TQI) obtained from the track recording car. The other data known as the Ride Index (RI) depends on the ride comfort which relies on the structural and functional aspects of the accelerometer (micro-controller-based oscillation monitoring) from the ride meter which is attached to the railway vehicles. The ride comfort which is the ride quality inspection of track and train conditions which are associated with acceleration and rotation of track conditions and train. The TQI - RI combined indices from the field were utilized to develop a mathematical degradation model equation that can be used to assess the degree of track degradation more precisely and as a substitute in the event of track recording machinery breakdown, through statistical and engineering approaches. The result of this study compares very favorably with the literature. It will guide and improve the accuracy of track design and maintenance standards and develop the schedule with effective and efficient use of manpower, maintenance and machineries.

*Keywords* – Include at least 5 keywords or phrases

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## Coi Gene Based Phylogenetic Studies Of Alaudidae (Passeriformes) From Pakistan

Fakhra Nazir, Fakhra I Abbas, Sahar Fazal

*Centre for Bioresource Research (CBR), Islamabad, Pakistan*

*Capital University of Science and Technology (C.U.S.T), Islamabad, Pakistan*

[fakhra.nazir.979@gmail.com](mailto:fakhra.nazir.979@gmail.com)

**Abstract** - DNA barcode data of birds is currently increasing globally and providing rich source to answer evolutionary questions and rapid species identification means and demanding similar research in Pakistan. Passeriformes are broadly divided into two super orders: Acanthisitti and Tyranni, Alaudidae family belongs to latter. According to recent molecular studies this family of birds consist of 20 genera and 92 species globally with 3 extinct, 2 critical and 3 near threaten species. Molecular phylogeny of this family has been attempted comprehensively globally and has recommended novel arrangements for several species and genera. The aim of this study was to identify samples genetically and find evolutionary relationship among them.

For this purpose phylogenetic tree was reconstructed to find genetic relationship among different species of family Alaudidae by amplification of Cytochrome Oxidase Subunit I of samples collected from different areas of Pakistan. Their preserved skins were used for mitochondrial genome (mtDNA) extraction from selected regions i-e folmer region comprising ~ 650 bp using universal primers.

Sequenced data was analyzed by Bio Edit software 7.0 versions and BLAST was performed on NCBI for identification of species based on the similarity index. Multiple sequence alignment calculated by CLUSTAL W and MEGA7 software used for phylogenetic relationship inference between different species by the neighbor joining (NJ) method. The nucleotide distances between sequence pairs estimated and diversities found using Kimura-two-parameter. Highly similar sequences were clustered together to show less diversities and barcoding was proved to be effective in identifying species of Alaudidae of Pakistan.

*Key Words: DNA barcoding, Cytochrome Oxidase Subunit I, Phylogenetic, Alaudidae*

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## Reduction Of Harmonics in Three-Phase Machine Drive Via The Selective Harmonic Elimination Methods

Rabiaa Houili, Mohamed Yacine Hammoudi and Abdennacer Titaouine

*Department/ MSE Laboratory, Mohamed KHIDER University of Biskra, Algeria*

*my.hammoudi@univ-biskra.dz.*

**Abstract** – This paper proposes an evaluation of a single three-phase PWM inverters feeding of a squirrel cage of the induction motors drive system based on selective harmonic elimination (SHE) control technique. The optimal switching angle of the transcendental equations describing the fundamental and harmonic components is obtained, by solving a set of nonlinear equations using the iterative numerical method of Newton-Raphson (N-R). In the case of the Newton-Raphson method, the selection of the different switching angle's initial values plays an important role in the rapidity and convergence of the solution. The salient contribution of this work is revealing the SHE efficiency in eliminating the lowest order harmonics and giving an improved higher quality from the output voltage waveform of inverter. Simulation results and FFT analysis are also obtained using Matlab Simulink, the comparison study between the SHE and Sinusoidal pulse width modulation (SPWM) techniques show that the first method can achieve a lower total harmonic distortion of Ia (THD) (7.61%) than that of SPWM as expected (8.37%).

*Keywords* – selective harmonic elimination, Sinusoidal pulse width modulation, Newton-Raphson, Induction Motors, Matlab Simulink

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## In Silico Investigation Of Several Series Of Heterocyclic Molecules For Drug Discovery

Chennai Yassmine, Belaidi Salah

Group of Computational and Pharmaceutical Chemistry, LMCE Laboratory, University of Biskra, BP 145 Biskra 07000, Algeria

[hind.chenie@univ-biskra.dz/0659416036](mailto:hind.chenie@univ-biskra.dz/0659416036)

[s.belaidi@univ-biskra.dz](mailto:s.belaidi@univ-biskra.dz)

**Abstract** -Drug discovery and design are inextricably linked to various branches of chemistry, particularly organic chemistry. Many aspects of chemistry must be involved in order to translate knowledge of the molecular, genetic, and cellular bases of cancer into effective therapies. Thus, the goal of this research is to identify promising active compounds for coumarin as CK2 protein kinase inhibitors using a QSAR model and drug similarity analysis. CK2 is a ubiquitous Ser/Thr-specific protein kinase that is required for cell cycle viability and progression. CK2 levels are particularly high in proliferating, normal, or transformed tissues, and transgenic mice expressing its catalytic subunit are responsible for lymphomas.

The work began with the optimization of the equilibrium structures of the basic coumarin in order to select the most reliable forecasting approach compared to experimentation and at the lowest computational cost. Following our research, we conduct a multiple linear regression (MLR) analysis to generate QSAR models.

An external validation research was done because the results show that the QSAR model of CK2 inhibitory activity is robust and has extremely strong prediction capacity, as indicated by R<sup>2</sup> values of 0.951 and 0.927, respectively, following linear regression analysis. The investigation using QSAR models is successful in screening 34 candidate chemicals. Following that, the compounds under consideration were evaluated for drug-likeness and reactivity (ADME, golden triangle, lipophylicity indices).

The results reveal that when supplied orally, the majority of the substances have no bioavailability issues.

The data also aid in determining which chemicals do not have clearance issues, as well as which are the most stable and reactive among those examined.

The anticipated findings of this study may aid in the development of novel coumarins with significant CK2 inhibitor activity.

*Keywords: coumarine, CK2, QSAR, MLR.*



## Ageing of Rotating Equipment Machines in Harsh Environment

Aiyad Gannan

*Assistant Professor – Mechanical Engineering  
School of Engineering Technology & Industrial Trades  
University of Doha for Science and Technology*

*Email: [aiyad.gannan@udst.edu.qa](mailto:aiyad.gannan@udst.edu.qa)*

**ABSTRACT** -Ageing is not about how old the equipment is; it is about what is known about its condition, and how that is changing over time. Ageing of rotating equipment machines has become an important subject to the turbomachinery industry in recent years. As many rotating machines are reaching or exceeding their design lives, they are subject to performance degradation, but more significantly, experience a potential for an increased risk of hazardous gas leakage to the atmosphere.

The principal aim is to provide guidance on assuring that the integrity of these machines is retained when operated beyond design life.

This document sets out to assist operators in meeting existing guidelines based on our experience of conducting ageing equipment surveys on behalf of the operators.



## **Analysis For Flow An Incompressible Fluid With Friction**

LAHLAH Taklit Hana

*Department of sciences, Ferhat abbas University, Algeria*

*lahlahhana@gmail.com*

**Abstract** –This paper deals with the asymptotic behavior of boundary value problems in a 3D thin domain with nonlinear Coulomb friction. Create a variational formulation of the problem and prove the existence and uniqueness of weak solutions. We then study the asymptotic behavior when one dimension tends to zero. In this case, the displacement uniqueness result to the limit problem is also proved.

*Keywords – Asymptotic approach; Boundary conditions; Nonlinear friction ; Reynolds equation*

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## Electrochemical Sensors Are Electronic Devices Used To Measure And Detect Specific Substances

Roumaissa LAIEB , Ilhem GHODBANE and Saida ZOUGAR

*Environmental Engineering Laboratory, Process Engineering Department, Faculty of Technology, BADJI Mokhtar University -Annaba-, Algeria.*

*laieb.roumaissa1211@gmail.com*

**Abstract** – In recent years, the development of sensitive sensors has become an important research topic, and electrochemical sensors in particular have attracted a great deal of attention in many fields, such as environmental monitoring, medicine, the food industry and security. An electrochemical sensor is defined as an electronic device which transforms a chemical quantity (concentration) called the measurand, into a usable quantity which is generally an electrical signal, whose operating principle is based on the coupling of two essential components including a recognition layer which is the receptor, the part sensitive to the presence of the targeted compound which can be a conductive polymer, metal, metal oxide or CNTs... and a physical component which constitutes the so-called transducer which generates a signal whose intensity is a function of the concentration of the targeted compound. The recognition layer interacts with the target analyte, and the transformations resulting from this interaction are translated by the transduction element into usable signals before being transmitted to a computer system for appropriate algorithmic processing. There are various types of electrochemical sensor, including potentiometric, amperometric, impedimetric and conductimetric. Each type is adapted to specific applications, depending on the chemical properties of the sample to be analysed. They offer several advantages, such as high sensitivity, high selectivity and fast response time. They are also relatively inexpensive and can be miniaturized for portable applications. We can therefore say that an electrochemical sensor is a device that measures the concentration of a specific chemical species in a solution by converting the chemical reaction into an electrical signal.

*Keywords – Electrochemical sensor, electronic device, selectivity, sensitivity, transducer.*

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## Sustainable 3D Printing with Palm Fiber-Reinforced Composites

Hocine Heraiz, Salah Amroune, Khalissa Saada, Riyadh Benyettou

*School of Civil engineering University of science and technology Beijing, 100083, PR China.*

*University of M'sila; B.P 166 ICHBELIA.M'sila 28000 Algeria.*

*Laboratory of materials and mechanics of structures (LMMS) M'sila. Algeria.*

[hheraiz@gmail.com](mailto:hheraiz@gmail.com)

**Abstract** – This study investigates the use of palm fiber as a reinforcement in 3D printing filaments, aiming to create sustainable and mechanically robust composite materials. Palm fiber, a biodegradable and cost-effective agricultural byproduct, was integrated into a biopolymer matrix, resulting in enhanced tensile and flexural strength in the printed samples. The findings suggest that palm fiber can significantly improve the performance of 3D-printed materials while reducing environmental impact, offering a viable alternative to synthetic fibers in sustainable manufacturing.

*Keywords – Palm Fiber, 3D Printing, Sustainable Composites, Natural Fibers, Biodegradable Materials*

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## Comprehensive First-Principles Investigation of the Electronic, Optical, Mechanical, and Thermoelectric Properties of $\alpha$ -Graphyne

R. Masrour

Laboratory of Solid Physics, Faculty of Science, Sidi Mohamed Ben Abdellah University, Dhar Mahraz, BP 1796, Fez,  
Morocco

[rachidmasrour@hotmail.com](mailto:rachidmasrour@hotmail.com)

**Abstract** – First-principles calculations combined with Boltzmann transport theory were employed to investigate the structural, electronic, dielectric, optical, mechanical, and phonon transport properties of  $\alpha$ -graphyne. The HSE06 functional reveals that  $\alpha$ -graphyne is a semiconducting material with a finite direct bandgap arising from its unique hybridization of sp and sp<sup>2</sup> carbon atoms. The density of states and band dispersion indicate high carrier mobility, favorable for efficient charge transport. The dielectric response shows strong polarization under an external electric field, suggesting potential for nanoelectronic and energy-storage applications. The optical analysis demonstrates pronounced absorption in the visible and ultraviolet regions, along with high reflectivity and a moderate refractive index, indicating the suitability of  $\alpha$ -graphyne for photonic and optoelectronic devices. From a mechanical perspective,  $\alpha$ -graphyne exhibits remarkable in-plane stiffness, high Young's modulus, and mechanical stability comparable to graphene, confirming its robustness for flexible and high-strength nanodevices. Regarding thermal and thermoelectric behavior,  $\alpha$ -graphyne shows a maximum power factor of 0.019 W/(m·K<sup>2</sup>) and a lattice thermal conductivity of 9.24 W/(m·K) at room temperature. The maximum thermoelectric figure of merit for p-type  $\alpha$ -graphyne reaches 0.85 at 700 K, highlighting its moderate thermoelectric efficiency. Overall, these results demonstrate that  $\alpha$ -graphyne is a multifunctional 2D carbon-based material combining electronic, optical, and mechanical excellence with promising thermoelectric potential for next-generation nanoelectronic and energy conversion applications.

*Keywords* –  $\alpha$ -graphyne; first-principles calculations; electronic and optical properties; mechanical stability; thermoelectric performance

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## First-Principles Investigation of Structural, Electronic, Thermoelectric, and Photovoltaic Properties of $Y_2C$ ( $Y = Si, Ge, Sn$ ) Monolayers

R. Masrour

Laboratory of Solid Physics, Faculty of Science, Sidi Mohamed Ben Abdellah University, Dhar Mahraz, BP 1796, Fez,  
Morocco

[rachidmasrour@hotmail.com](mailto:rachidmasrour@hotmail.com)

**Abstract** – We investigated a new class of two-dimensional binary compounds,  $Y_2C$  ( $Y = Si, Ge, Sn$ ), using first-principles calculations to explore their structural, electronic, thermoelectric, and photovoltaic properties. The monolayers stabilize in multiple configurations, with the P1 phase being most stable for  $Si_2C$  and  $Ge_2C$ , and  $\bar{P}3m1$  favored for  $Sn_2C$ . The coexistence of polar and nonpolar structures suggests possible polymorphism and tunable functionalities. Phonon dispersion and ab initio molecular dynamics confirm their dynamic and thermal stability. A metal–semiconductor transition between  $P3m1$  and P1 phases, driven by a Peierls-type distortion, enables control of electronic behavior, crucial for thermoelectric and optoelectronic devices. The calculated Seebeck coefficients and low thermal conductivity indicate promising thermoelectric efficiency, while suitable bandgaps and strong optical absorption highlight their potential for photovoltaic energy conversion. Although formation is endothermic, substrate-assisted growth may stabilize these systems. Overall,  $X_2C$  monolayers exhibit a unique combination of electronic tunability, optical activity, and thermal robustness, making them promising candidates for next-generation 2D thermoelectric and photovoltaic technologies.

*Keywords* –  $Y_2C$  monolayers; 2D materials; thermoelectric properties; photovoltaic applications; first-principles calculations

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## First-Principles Investigation of Electronic, Magnetic, Mechanical, Phonon, and Thermoelectric Properties of Fe-Hf-Zr-B-Cu Alloys

R. Masrour

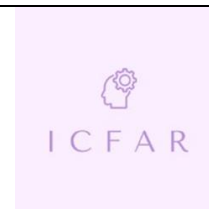
Laboratory of Solid Physics, Faculty of Science, Sidi Mohamed Ben Abdellah University, Dhar Mahraz, BP 1796, Fez,  
Morocco

[rachidmasrour@hotmail.com](mailto:rachidmasrour@hotmail.com)

**Abstract** – We present a comprehensive first-principles study of the structural, electronic, magnetic, mechanical, phonon, and thermoelectric properties of  $\text{Fe}_{86}\text{Hf}_2\text{Zr}_7\text{B}_4\text{Cu}_1$  and  $\text{Fe}_{84}\text{Hf}_4\text{Zr}_7\text{B}_4\text{Cu}_1$  alloys. Electronic structure analysis shows metallic behavior with dominant Fe 3d states at the Fermi level, while magnetic calculations reveal a ferromagnetic ground state, with total magnetic moments slightly decreasing as Hf content increases. Mechanical properties indicate high elastic moduli and hardness, confirming structural stability. Phonon dispersion confirms dynamic stability, and thermodynamic analysis suggests robustness at elevated temperatures. Calculated thermoelectric coefficients reveal moderate Seebeck values and low thermal conductivity, indicating potential for energy conversion. Increasing Hf enhances mechanical rigidity while slightly reducing magnetism. Elastic constants satisfy Born stability criteria, and phonon density of states shows significant Fe contributions at low frequencies. Overall, these results highlight the interplay between composition, magnetism, and transport properties, positioning Fe-Hf-Zr-B-Cu alloys as promising candidates for multifunctional structural and thermoelectric applications.

*Keywords* – Fe-Hf-Zr-B-Cu alloys; electronic properties; magnetic properties; mechanical and phonon stability; thermoelectric performance

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## The Potential Role Of Halophytic Nanoparticles To Improve Plant Growth And Salinity Resilience

Neelma Munir, Maria Hanif and Zainul Abideen

*Department of Biotechnology, Lahore Collegefor Women University, Lahore , Pakistan*

*Dr. Muhammad Ajmal Khan Institute of Sustainable Halophyte Utilization, University of Karachi, Karachi, Pakistan*

*neelma.munir@lcwu.edu.pk*

**Abstract** – During the recent years nanotechnology is of immense importance for its use in a number of applications including agriculture. Nano fertilizers are a promising and cost-effective approach for enhancing plant growth and to make them resilient against different stresses posed on plant as a result of climate change. Evapotranspiration as a result of climate change is leading to increase in soil salinity. Nanoparticles made from halophytes can be a sustainable approach to mitigate the negative effects of salt stress on plant growth. During the present work Zn nanoparticles have been synthesized from halophytic plants. The parameters for nanoparticle synthesis like salt concentration, the amount of plant extract, pH, and temperature were optimized using a central composite design (CCD) of response surface methodology (RSM). The ZnO NPs were characterized using UV–Vis spectroscopy, Fourier transform infrared spectroscopy (FT-IR), field emission scanning electron microscopy (FESEM), energy dispersive spectroscopy (EDS), X-ray diffraction (XRD), and dynamic light scattering (DLS). Foliar application of nanoparticles on tomato plants resulted in an improvement in plant growth under salt stress as indicated by morphological and biochemical parameters. The present work thus indicates that the application of halophyte-mediated nanoparticles on tomato plants grown under saline conditions effectively promotes tomato plants' growth, thereby mitigating the negative impacts of salt stress.

*Keywords – halophyte, nanoparticle, salt stress, tomato,*

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## Low-Latency Communication System for Time-Sensitive IoT Applications

Immanuel Prabakaran S, R Deivanayaki, Aswini M, S Muthurajan

*Research Scholars, Department of EEE, AMET University, Chennai, Tamil Nadu, India*  
*Assistant Professor, Department of Marine Engineering, AMET University, Chennai, Tamil Nadu, India*

*imman.amet@gmail.com*

**Abstract** - This paper proposes a low-latency communication system for time-sensitive Internet of Things (IoT) applications that require rapid and reliable data exchange. The proposed system integrates edge computing, adaptive routing, and intelligent bandwidth allocation to achieve minimal communication delay and high transmission reliability. A hybrid communication model utilizing 5G, Wi-Fi 6, and LPWAN technologies provides seamless connectivity across heterogeneous networks. Furthermore, AI-based traffic prioritization and lightweight message scheduling are employed to reduce congestion and packet loss. Experimental results indicate up to a 60% reduction in end-to-end latency compared to conventional IoT communication architectures, making the system highly suitable for industrial automation, smart healthcare, and vehicular IoT environments.

**Keywords**— *Low-latency communication, Internet of Things (IoT), edge computing, time-sensitive networks, adaptive routing, 5G, Wi-Fi 6, LPWAN, real-time systems.*

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## Quasistatic Electro-Viscoelastic Problem And Its Asymptotic Behavior

Abderrahmane Mihoub, Mourad Dilmi, Hamid Benseridi

*Department of Mathematics, Faculty of sciences, Setif I-University, 19000, Algeria*  
*Applied Mathematics Laboratory, Department of Mathematics, Setif-I University 19000 Algeria*

*dilmorad@gmail.com*

**Abstract** – This paper is devoted to the study of the asymptotic analysis of a mathematical model involving a frictionless contact between an quasistatic electro-viscoelastic and a conductive foundation in a three-dimensional thin domain  $\Omega^\varepsilon$ . The contact is modeled with Tresca friction law. We derive a variational formulation of the problem and prove its unique weak solution. Then, we study the asymptotic analysis when the small parameter of the domain tends to zero. Finally, the specific Reynolds limit equation and the limit of Tresca free boundary conditions are obtained.

*Keywords* – analysis, a priori estimates, law of Tresca, materials elctro-viscoelastic, piezoelectric materials

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## **Abstract Sifferential Equations Of Elliptic Type With An Abstract Robin Boundary Condition Containing Two Spectral Parameters Study In a Hölder Space: Non Commutative Framework**

Mohammed Rabah and Rabah Haoua

*Mathematics Department / Institute of Exact Sciences and Informatics, Abdelhamid Ibn Badis University, LMPA, 27000 Mostaganem, Algeria.*

*Department of Technical Sciences/ Institute of Exact Sciences and Informatics, Abdelhamid Ibn Badis University, LMPA, 27000 Mostaganem, Algeria.*

*mohammed.rabah@univ-mosta.dz*

**Abstract** – This document presents the some new results on operational second order differential equations of elliptic type with general Robin boundary conditions in a non-commutative framework. The study is performed when the second member belongs to a Hölder space. Existence, uniqueness and optimal regularity of the classical solution are proved using interpolation theory and results on the class of operators with bounded imaginary powers. We also give an example to which our theory applies. This paper improves naturally the ones studied in the commutative case by M. Cheggag, A. Favini, R. Labbas, S. Maingot and A. Medeghri: in fact, introducing some operational commutator, we generalize the representation formula of the solution given in the commutative case and prove that this representation has the desired regularity.

*Keywords* – *second-order abstract elliptic differential equations, Robin boundary conditions, analytic semigroup, maximal regularity, Hölder space.*

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## Antimicrobial Activity Of Algerian Medicinal Plant

Khaoula Menaiaia, Fadila Khaldi, Amina Ouahab

Laboratory of Sciences and Technology of Water and Environment, University of Mohamed Cherif Messaadia/PO Box 1553.  
41000, Souk-Ahras, Algeria

[menaiaiakhaoula@gmail.com](mailto:menaiaiakhaoula@gmail.com)

**Abstract** – The current work concerns a medicinal plant widely used by indigenous Algerians *Marrubium vulgare* L. of the lamiaceae family, this plant have extraordinary therapeutic properties. This research encompasses several aspects: a phytochemical study aimed to assess the CPG/MS analysis, as well as the antifungal activity of hexane, dichloromethane, acetone and methanol extracts from leaves of *Marrubium vulgare* L.

The chemical composition of the two extracts of *Marrubium vulgare* L. is determined by gas chromatography coupled with mass spectrometry (GC-MS). The results of the analysis showed that the hexane extract studied consists mainly of tetracontane followed by tetracosane, 7-Hexadecenal, (Z)-, Linolenic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester (Z,Z,Z)-, Tetrapentacontane and n-Hexadecanoic acid while the dichloromethane extract is essentially composed of Naphtho[2,1-b]furan-2(1H)-one, decahydro-3a,6,6,9a-tetramethyl -, [3as-(3a.alpha.,5a.alpha.,9a.beta.,9b.alpha.)]- followed by Cyclopropaneacetic acid, 2-hexyl, Phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-methyl, Ethyl iso-allocholate and 14-.beta.-H-pregna.

Indeed, for the antifungal activity evaluated, We have also tested the effect of the different extracts against two phytopathogenic fungi strains by the disc-diffusion method. The inhibitory effect were important for the two tested strains. The extracts of *M. vulgare* have important antifungal activity. Statistical analysis indicates no significant differences at  $P > 0.05$ . On the other hand. Based on these results, it is right to conclude that *M. vulgare* is an important source of bioactive compounds with antifungal properties.

*Keywords: Marrubium vulgare L., antifungal activity, CPG/MS, , phytochemical.*

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## Double - Diffusive Natural Convection In a Tilted Square Cavity Submitted To Cross Gradients Of Temperature And Concentration

Nesrine Rachedi and Messaoud Guellal

*Laboratory of Chemical Process Engineering, Faculty of Technology, Ferhat ABBAS Sétif 1 University, Algeria*

*[nesrine\\_rachedi@yahoo.fr](mailto:nesrine_rachedi@yahoo.fr)*

**Abstract** – Numerical results of two-dimensional double diffusive natural convection in a tilted square cavity submitted to cross gradients of heat and solute concentration are reported in this study. The numerical model is two-dimensional, laminar and uses a finite volume method to evaluate velocities, temperatures and concentrations. The considered applications emphasize the thermal performance of the cavity through the study of the effect of certain relevant factors such as; concentration, the angle of inclination of the cavity.

*Keywords – natural convection, double diffused, inclinaiton angle, finite volume, cross gradients.*

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## Some Parabolic Equations and Application in Image Restoration

Abir Bounaama, Fatima Zohra Zeghibib and Messaoud Maouni

*Department of Mathematic/LAMAHIS, University of 20 August 1955, Algeria*

*Department of Mathematic/LAMAHIS, University of 20 August 1955, Algeria*

*Department of Mathematic/LAMAHIS, University of 20 August 1955, Algeria*

*a.bounaama@univ-skikda.dz*

**Abstract** –This document presents some nonlinear parabolic problem involving the well known p-laplacian and some operators having exponential growth with respect to the gradient.

We start by dealing the asymptotic behavior for some evolution the we give some results in image processing.

*Keywords* –parabolic equation, image processing, sobolev spaces

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## On Some Generalized Hilfer Fractional Differential Coupled Systems with Infinite Delay

Abdelkrim Salim

*Faculty of Technology, Hassiba Benbouali University, Algeria*

*salim.abdelkrim@yahoo.com*

**Abstract** – This paper establishes the existence of solutions for a particular type of boundary value problems involving implicit nonlinear fractional differential coupled systems with generalized Hilfer fractional derivative and infinite delay. Our approach relies on relevant fixed-point theorems, and we support our findings with comprehensive examples to demonstrate their importance.

*Keywords* – Hilfer fractional derivative, Coupled systems, Existence, Uniqueness, Fixed point, Boundary conditions

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## Existence And Multiplicity For Positive Solutions Of a System Of First Order Differential Equations With Multipoint And Integral Boundary Conditions On Time Scale

Ibtissem Daira, Malek Abdelali , Ahmed Ayoub.boukelia and Isra Nada

*Department Of Mathematics And Informatics, University Of Souk Ahras, Algeria*

*Department Of Mathematics And Informatics, University Of ANNABA ,Algeria*

*Department Of Mathematics And Informatics, University Of setif, Algeria*

*Department Of Mathematics And Informatics, University Of setif, Algeria*

[i.daira@univ-soukahras.dz](mailto:i.daira@univ-soukahras.dz)

[isranada19@gmail.com](mailto:isranada19@gmail.com)

[malek.abdelali@univ-setif.dz](mailto:malek.abdelali@univ-setif.dz),

[ahmedayoub.boukelia@univ-setif.dz](mailto:ahmedayoub.boukelia@univ-setif.dz)

**Abstract** – In this paper, we state and prove theorems related to the existence and multiplicity for positive solutions of a system of first order differential equations with multipoint and integral boundary conditions. The main tool is the fixed point theory.

*Keywords* – Initial boundary value problems, nonlinear differential system, multipoint and integral boundary conditions, positive solutions, the fixed point theory

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## High-Efficiency And Environmentally Friendly Thermoelectric Material: Full Heusler Ba<sub>2</sub>AgBi Alloy

M. Matougui , B. Bouadjemi · T. Lantri · M. Houari, A.Zitouni, S.Haid and M.A. kadaoui

*Laboratory of Technology and of Solids Properties, Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria*

*Instate of Sciences and Technology, Tissemsilt University, 38004, Algeria*  
*Laboratoire CaSiCCE, B.P. 1523 El M'Naouar 31000, ENP- Maurice Audin Oran, Algeria*

[matouguimohamed@hotmail.com](mailto:matouguimohamed@hotmail.com)

**Abstract** – The field of thermoelectric materials (TE); the term thermoelectric designating the interaction between heat and electricity and therefore, has expand in importance over the past decade for its capability to solve a growing energy crisis due to deficiency of perennial resources and other environmental complications, as TE compounds may be able to resolve energy production problems and refrigeration technologies, Thermoelectric materials are materials with the aptness to convert waste heat into electricity and vice versa. Over the past decades, scientific researchers have developed various methods to improve the performance of TE materials, characterized by a fundamental factor which is the figure of merit called ZT (dimensionless). Depending on the electronic properties, we found that the Full Heusler alloy Ba<sub>2</sub>AgBi, has a semiconductor behavior with an indirect gap of value 0.365 eV as specified by the mBJ-GGA approximation and which is the most recommended, this motivated us to calculate the thermoelectric properties of these compounds using the semi-classical theory of Boltzmann under approximation of the time of continuous relaxation (CRTA), as implemented in BoltzTraP code.

Moreover, this compound is characterized by fairly high values of the merit factor (ZT) (close to unity) and the Seebeck coefficient (S) and which make this compound promising candidate for thermoelectric applications. As no experimental data has been reported to date concerning this Heusler alloy, our theoretical predictions of electronic and thermoelectric properties are likely to be verified experimentally.

**Keywords:** Full Heusler, indirect band gap, Seebeck coefficient; Electrical conductivity; Merit factor.

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## AB Initio Calculation Of Electronic And Magnetic Structures Properties Of TaIrCo Compound

Addou Oussama , Touia Amina

*Materials Science and Applications Laboratory, Faculty of Science and Technology, University of Ain Temouchent, Belhadj  
Bouchaib. BP 284, Ain-Temouchent, 46000, Algeria*

*Materials Science and Applications Laboratory, Faculty of Science and Technology, University of Ain Temouchent, Belhadj  
Bouchaib. BP 284, Ain-Temouchent, 46000, Algeria*

*oussama.fr1996@gmail.com*

**Abstract** – In this work, the structural, electronic and magnetic properties of the TaIrCo alloy for the two non-magnetic (NM) and ferromagnetic (FM) states, were presented using a first principal calculation. We applied the Full Potential Linearized Augmented Plane Wave (FP-LAPW) [1] based on density functional theory (DFT) [2] In addition, For the exchange and correlation potential, we used the generalized gradient approximation (GGA-PBE) [3] and implemented in the Wien2k package [4]. The results obtained for the density of states and the band structure reveal that our compound has a semi-metallic character. The TaIrCo material has been intensively studied because of their numerous technological applications, especially in the field of electronics and spintronics.

*Keywords* – wien2k; electronic; spintronics; structural; DFT

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## Removal of Carmine Cochineal food dye from aqueous media by adsorption on peanut shells

Atef Ali Ahmed<sup>\*1</sup>, Rayane Diaf<sup>2</sup>, Zhour Hattab<sup>2</sup>, Yamina Berredjem<sup>2</sup>

<sup>1</sup>Laboratory of Physics matter and Radiation, Mohammed Cherif Messaadia University, Souk-Ahras, Algeria

<sup>2</sup>Laboratory of Water Treatment and Valorization of Industrial Wastes, Department of Chemistry, Faculty of Sciences, University Badji Mokhtar, Annaba, Algeria.

[a.aliahmed@univ-soukahras.dz](mailto:a.aliahmed@univ-soukahras.dz)

**Abstract** – One third of dyes found in the environment are food dyes, their toxicity and their contamination of the soils has gone unnoticed for many years, but not anymore, Proof of the concern is the numerous investigations carried out in the last four decades to set methods for evaluating and eliminating food dyes from waste water. Until today, various processes have been used, including physicochemical and biological processes that are difficult to manage and costly or less efficient. Among these methods, adsorption is the most used and the easiest to implement. Therefore, the aim of this study is to evaluate the efficiency of peanut shells as a potential bio adsorbent for the removal of one of the oldest anionic dyes, Carmine Cochineal, used globally as an additive in foods, pharmaceuticals and cosmetics. The influence of operational parameters such as solution pH (1-8), bio adsorbent dosage (0,01-0,1g), stirring speed (100-300 rpm), initial dye concentration (20-100 mg/L), and temperature (25-45 C) on Carmine Cochineal removal efficiency was investigated. Test results show that the highest adsorption efficiency reached 96% under the optimal conditions.

**Keywords** – Adsorption, Food dyes, Peanut shells, Carmine cochineal, Water treatment

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## Synthesis of Graphitic Nitride Modified Maghnite Clay Catalyst for Efficient Dye Degradation Via Impregnation Calcination Method

Mekıdiche MOUNİR<sup>1</sup>, Mekıdiche BOUCHRA<sup>2</sup> and Khaldi KHADİDJA<sup>3</sup>

<sup>1</sup>Laboratory of Catalysis and Synthesis in Organic Chemistry, Faculty of Sciences, University of Tlemcen, Algeria.

<sup>2</sup>Scientific and Technical Research Center in Physico-Chemical Analyses CRAPC, BP 384, Bou-Ismaïl, RP 42004, Tipaza, Algeria

\*[mounirmekidiche02@gmail.com](mailto:mounirmekidiche02@gmail.com)

**Abstract** – Graphitic nitride (gC<sub>3</sub>N<sub>4</sub>) is a promising material for catalytic applications due to its unique electronic and chemical properties. In this study, a novel gC<sub>3</sub>N<sub>4</sub>-Maghnite catalyst was synthesized via a green approach utilizing impregnation calcination methods. The synthesized catalyst was characterized using BET, FTIR, and XRD, which confirmed the successful synthesis of gC<sub>3</sub>N<sub>4</sub> with a high surface area and a well-defined crystalline structure.

The efficiency of the synthesized catalyst was evaluated for the degradation of methylene blue dye, a commonly used dye in the textile industry. Under UV lamp irradiation, the catalyst achieved an impressive 97% degradation of the dye within just 40 minutes.

This study demonstrates the potential of gC<sub>3</sub>N<sub>4</sub> catalysts synthesized via impregnation calcination method for efficient dye degradation. The results obtained from this study are significant for the development of sustainable and eco-friendly approaches for dye degradation in industrial wastewater treatment. The use of such catalysts can have a positive impact on the environment and pave the way for future research in this area.

**Keywords** – Maghnite, gC<sub>3</sub>N<sub>4</sub>, Methylene blue, Photocatalysis

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## The Thiazolidinone Molecule's Performance and Examination of Its Nonlinear Properties

Fatima ZOHRA BOUDJENANE<sup>1</sup>, Nouridine BOUKABCHA<sup>2</sup>, Nassima BOURAHLA<sup>3</sup>, Ahmed ABDELMOULA<sup>4</sup> and Abdelkader CHOUAÏH<sup>5</sup>

<sup>1</sup>Department of process engineering /Laboratory of technology and solid properties, Abdelhamid Ibn Badis University, Mostaganem, 27000, Algeria

<sup>2</sup>Department of electrical engineering / Abdelhamid Ibn Badis University, Mostaganem, 27000, Algeria

<sup>3</sup> Department of physics, University center MORSLI Abdellah of Tipaza , Algeria

\*[fatima.boudjenane.etu@univ-mosta.dz](mailto:fatima.boudjenane.etu@univ-mosta.dz)

**Abstract** – The research described involves the synthesis and characterization of a thiazolidinone derivative containing a thiazole ring, and the investigation of its potential for nonlinear optical (NLO) applications and biological activity. The molecule's structure and properties were analyzed using various computational and experimental methods, including XRD single crystal, FTIR, and UV-visible spectrum analysis. The theoretical DFT quantum chemical computations were used to compare the experimental results and to calculate the HOMO-LUMO energy levels and the molecular electrostatic potential. The presence of a dihedral angle between the benzene and thiazolidinone rings was identified as a unique feature of this molecule. The calculated electric dipole moment, static and dynamic polarizability, and hyperpolarizabilities suggest that this molecule could be a strong candidate for NLO applications. Hirshfeld surface analysis was used to investigate the chemical bonding and non-classical intermolecular interactions in the crystal structure of the molecule. The analysis identified close interactions between H...H, H...O/O...H, H...C/C...H, and C...O/O...C. The contributions of these interactions were further analyzed using 2D-Fingerprint plots. Molecular docking was used to predict the biological activity of the molecule, and the results suggest that it has potential as a drug candidate. The fundamental prediction of substance activity spectra (PASS) was also explored to determine the biological activity of the molecule. Overall, the research demonstrates the potential of thiazole-containing heterocycles for a wide range of biological and material science applications. The combination of experimental and computational methods provides valuable insights into the molecular structure, bonding, and properties of the investigated molecule.

**Keywords** – Thiazole, hyperpolarizability, FTIR, single crystal, PASS, molecular docking



## The Investigation of Layered Double Hydroxide Using XRD and FTIR

Fatima ZOHRA BOUDJENANE<sup>1</sup>, Nouridine BOUKABCHA<sup>2</sup>, Nassima BOURAHLA<sup>3</sup>, Ahmed ABDELMOULA<sup>4</sup> and Abdelkader CHOUAÏH<sup>5</sup>

<sup>1</sup>Department of process engineering /Laboratory of technology and solid properties, Abdelhamid Ibn Badis University, Mostaganem, 27000, Algeria

<sup>2</sup>Department of electrical engineering / Abdelhamid Ibn Badis University, Mostaganem, 27000, Algeria

<sup>3</sup> Department of physics, University center MORSLI Abdellah of Tipaza , Algeria

[\\*fatima.boudjenane.etu@univ-mosta.dz](mailto:fatima.boudjenane.etu@univ-mosta.dz)

**Abstract** – The study focused on layered double hydroxides (LDHs), which are materials with a layered structure composed of metal cations in a host layer and anions in a guest layer. LDHs have emerged as a versatile and promising class of materials with a wide range of potential applications, and ongoing research continues to explore their properties and potential uses in various fields. LDHs have been studied for their potential use as adsorbents for industrial wastewater treatment due to their ease of synthesis, surface properties, ionic exchange capabilities, basic characteristics, and high adsorbent properties. In this study, an LDH based on zinc and chrome (ZnCr-CO<sub>3</sub>) was synthesized using an anion exchange technique, and its anion exchange properties were investigated. X-ray diffraction and infrared spectroscopy were used to characterize the synthesized LDH and its ability to exchange anions. The study highlights the importance of LDHs in the treatment of industrial wastewater and demonstrates the potential for using anion exchange techniques to enhance their properties. The use of X-ray diffraction and infrared spectroscopy provided valuable information on the structure and properties of the synthesized LDH, indicating the potential for further optimization and use in industrial applications. Overall, this study contributes to the growing body of research on the use of LDHs as adsorbents for wastewater treatment.

**Keywords** – LDHs, anion exchange, X-ray diffraction, wastewater, infrared spectroscopy

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## The NLO Characteristics of Push-Pull Coordination Compound

Fatima ZOHRA BOUDJENANE<sup>1</sup>, Nouridine BOUKABCHA<sup>2</sup>, Nassima BOURAHLA<sup>3</sup>, Ahmed ABDELMOULA<sup>4</sup> and Abdelkader CHOUAÏH<sup>5</sup>

<sup>1</sup>Department of process engineering /Laboratory of technology and solid properties, Abdelhamid Ibn Badis University, Mostaganem, 27000, Algeria

<sup>2</sup>Department of electrical engineering / Abdelhamid Ibn Badis University, Mostaganem, 27000, Algeria

<sup>3</sup> Department of physics, University center MORSLI Abdellah of Tipaza , Algeria

[\\*fatima.boudjenane.etu@univ-mosta.dz](mailto:fatima.boudjenane.etu@univ-mosta.dz)

**Abstract** – Nonlinear optical (NLO) properties refer to a material's ability to exhibit optical qualities that are not directly proportional to the intensity of incident light. NLO materials have potential applications in optical communication, information processing, and sensing, making their study important. The structure of push-pull Mo complexes with ONO tridentate ligands mentioned in the statement was confirmed using various analytical methods, such as NMR, IR, and HRMS analysis. The compounds were also found to be thermally stable based on TGA measurements. According to the study, the Mo complexes exhibited enhanced NLO responses compared to their boron and tin analogs, suggesting that they could be used as building blocks for NLO materials. This enhancement may be attributed to the unique electronic structure of the Mo center and the push-pull nature of the ligands, which promote charge transfer and polarizability. Overall, the study highlights the potential of Mo complexes with ONO tridentate ligands as strong candidates for developing NLO materials. However, further research is necessary to fully understand the underlying mechanisms of their improved NLO properties and to explore their potential applications in various fields.

**Keywords** – polarizability, NLO, push-pull, NMR, ONO

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## Renewable Energy Hardening of Concretes for Maritime Structures and Its Effect on Mechanical Performance

Ben AMMAR BEN KHADDA<sup>1</sup>

<sup>1</sup>*Civil and Hydraulic Engineering Department/Biskra University, Algeria*

[\\*b.benammar@univ-biskra.dz](mailto:b.benammar@univ-biskra.dz)

**Abstract** – The influence of Renewable energy hardening (solar energy) on the mechanical strength for prefabricated concrete for maritime structures was investigated. An experimental program was carried out to study in parallel the effect of water/cement ratio (0.4 to 0.6), the influence of cement type and the influence of curing methods (water curing, air curing, hardening at 29 and 45°C) on the compressive strength of samples concrete. Six similar formulations are made from ordinary Portland cement (CEM I 42.5) and a compound cement (CEM II/B 42.5). The results obtained flow highlight the beneficial effect for this technical method to achieve high compressive strength, especially in the earlier ages of curing. However, after 28 days a strength reduction was observed and the initial absorption is an increasing function of the w/c ratio, the higher the initial absorption rate increases and the resistance to sulfuric acids is reduced.

**Keywords** – Concrete, Renewable energy Hardenig, Mechanical strength Precast concrete, Initial absorption

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## The Optoelectronic Properties of Novel Lithium Tetrafluoroaurate Material LiAuF<sub>4</sub>: First-Principles Calculations

Ishak MEBARKIA<sup>1</sup>

<sup>1</sup>Applied Optics Laboratory, Institute of Optics and Precision Mechanics, Ferhat Abbas University Setif 1, Algeria

[\\*ishak.mebarkia@univ-setif.dz](mailto:ishak.mebarkia@univ-setif.dz)

**Abstract** – This study deals with the first theoretical investigation of structural, electronic, and optical properties of the LiAuF<sub>4</sub> ternary compound using first-principles calculations within the framework of the density functional theory. The calculated structural parameters and the internal atomic coordinates are in accordance with the experimental ones stated in the literature. The obtained electronic structure indicates that this compound is a semiconductor material with a direct band gap. According to the calculated optical properties, the extensive optical absorption range in the ultraviolet region (UV) suggests that this semiconductor could be helpful for particular applications in UV optoelectronic devices; Consequently, this theoretical study is probable to support future experimental work.

*Keywords* – first-principles calculations, optoelectronic properties, LiAuF<sub>4</sub> material, semiconductor behavior, UV devices

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## Beta Cell Damage and Diabetes Induced by Streptozotocin in Wistar Rats and the Effect of Nadh Administration

Abdellatif AMINA<sup>1</sup>, Slama NADA<sup>2</sup>, Bahria KARIMA<sup>3</sup>, Dahman OUKRIF<sup>4</sup>, Birkmayer GEORGE<sup>5</sup>,  
Oumouna MUSTAPHA<sup>6</sup> and Benachour KARINE<sup>7</sup>

<sup>1</sup>Laboratory of Experimental Biology and Pharmacology, Yahia fares University, Medea, Algeria

<sup>2</sup>Department of Pathology, University College London, UK.

<sup>3</sup>Department of Medical Chemistry, University of Graz and Birkmayer Laboratories, Vienna, Austria.

\*[amina.abdellatif.bio@gmail.com](mailto:amina.abdellatif.bio@gmail.com)

**Abstract** – Diabetes mellitus is a chronic metabolic disease characterized by persistent hyperglycemia due to decrease in insulin efficiency. The persistent of the glycotoxic environment, energy deficient and oxidative stress are responsible of progressive dysfunction and death of functional pancreatic beta cells. NADH, present in every living cell, an essential coenzyme for many metabolic reactions and energy production, used to treat some autoimmune disorders such as Parkinson and Alzheimer. The aim of this study is to examine the preventive effect of NADH on STZ induced diabetes in rats. Wistar male rats were randomly divided into 3 groups, non-diabetic control, diabetic control (treated with STZ) and group treated with NADH. Histological analysis showed that STZ induced degenerative changes in beta-cells led to decreases in the number of functioning beta-cells and insulin immunoreactivity. However, NADH effectively prevented hyperglycemia and diabetes induced by STZ, this protective effect were associated with significant increase in the number of insulin immunoreactivity in beta-cells. Our data clearly demonstrate the protective effect of NADH from irreversible beta cell injury and oxidative stress generated after STZ administration.

*Keywords* - streptozotocin, diabetes, insulin, beta cells

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## Preparation and Characterization of Graphene Oxide-Polypyrrole Nanosheets Composite Hybrid

Leila LAMIRI<sup>1</sup>, Ouafia BELGHERBI<sup>2</sup>, Boussaha BOUCHOUL<sup>3</sup>, Katib HAMLAOUI<sup>4</sup>, Mouhamed  
HAMIDOUCHE<sup>5</sup>, Assia TOUNSI<sup>6</sup> and Radhia KHOUATRA<sup>7</sup>

<sup>1</sup>Research Center in Industrial Technologies CRTI, P.O. Box 64, Cheraga 16014, Algiers, Algeria

<sup>2</sup>Laboratoire d'Electrochimie et Matériaux, Département de Génie des Procédés, Faculté de Technologie, Université Ferhat  
Abbas Sétif, Sétif 19000, Algéri

[\\*l.lamiri@crti.dz](mailto:l.lamiri@crti.dz)

[\\*lamiri.lila@yahoo.fr](mailto:lamiri.lila@yahoo.fr)

**Abstract** –In this study, Polypyrrole/graphene oxide (PPy/GO) composite is synthesized by in situ oxidation polymerization of pyrrole (Py) in the presence of graphene oxide. The composite was characterized by Fourier transform infrared analysis to determine molecular vibration and functional groups, X-ray diffraction to determine phase purity and crystal structure, scanning electron microscopy, ultraviolet–visible (UV–vis), electrical conductivity measurements. FT-IR bands confirmed the presence of PPy, and GO in the PPy composite. XRD patterns showed the formation of PPy/GO. UV–visible analysis revealed an increase in band gap values with addition of GO and a good absorbance in the UV was observed. The composites exhibited noticeable improvement in electrical conductivity in comparison to pure polypyrrole. SEM analyses showed that the PPy/GO composite has a nanosheet structure, and PPy is spherical and uniformly distributed.

*Keywords* – Hybrid composite, Graphene oxide, Polypyrrole, Nanosheets

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## Study and Simulation of a Single-Phase Uncontrolled Rectifier Based on PFC System for Power Quality Enhancement

Oualid AISSA<sup>1</sup>, Abderrahim REFFAS<sup>2</sup> and Hicham TALHAOUI<sup>3</sup>

<sup>1</sup>*LPMRN Laboratory, Faculty of Sciences and Technology, University Mohamed El Bachir El Ibrahimi of Bordj Bou Arreridj, Algeria*

<sup>2</sup>*Department of Electromechanical, University Mohamed El Bachir El Ibrahimi of Bordj Bou Arreridj, Algeria*

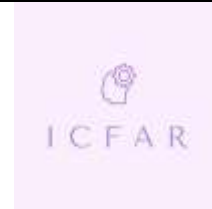
<sup>3</sup>*LPMRN Laboratory, Faculty of Sciences and Technology, University Mohamed El Bachir El Ibrahimi of Bordj Bou Arreridj, Algeria*

[\\*abderrahime.reffas@univ-bba.dz](mailto:abderrahime.reffas@univ-bba.dz)

**Abstract** – Nowadays, great efforts are made to improve the quality of energy where limits and requirements to be met by users have been imposed by authorized international organisms. The power quality of electrical systems has been significantly impacted by the ever-increasing usage of static converters in the tertiary and industrial sectors, such as diode and thyristor rectifiers. This paper simulates a curative solution, called power factor correction (PFC). The principal objective of the PFC is the improvement of the single-phase rectifier power quality. The presented conventional boost PFC topology consists of two stages; the first is a single-phase rectifier system with a diode bridge while the second is a boost stage. An effective control law based on classical PI and hysteresis controllers has been proposed in this paper. The first regulator ensure the regulation of the DC output voltage, while the second one is intended to control the power switch of the boost chopper forming the PFC system. Finally, Via the MATLAB/Simulink software, the studied PFC system has been tested under different operating modes concerning the variation of the load and the reference output voltage. The obtained simulation results show that the proposed control strategy of the studied PFC system makes it possible to have a source current of sinusoidal form with a THD of a 3.95% and a power factor very near to unity.

**Keywords** – *Uncontrolled rectifier, power quality, PFC, Proportional-Integral and hysteresis regulators, MATLAB/Simulink software*

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## Improved Variational Mode Decomposition and Teager Energy Operator for Bearing Fault Diagnosis

Yahia BOUSSELOUB<sup>1</sup>, Ali BELHAMRA<sup>2</sup>, Raid ABDMEZIANE<sup>3</sup> and Nadir BENAMIRA<sup>4</sup>

<sup>1</sup>Faculty of Sciences Engineering, Badji Mokhtar Annaba University, electromechanical systems laboratory, innovation academy, Annaba, Algeria.

<sup>2</sup>Department of electromecanics, Badji Mokhtar Annaba University, Annaba, Algeria.

<sup>3</sup>Department of electromecanics, Badji Mokhtar Annaba University, Annaba, Algeria.

<sup>4</sup>Department of electromecanics, Badji Mokhtar Annaba University, Annaba, Algeria.

[\\*yahia.bousseloub11@gmail.com](mailto:*yahia.bousseloub11@gmail.com)

**Abstract** – A time-frequency analysis method based on improved variational mode decomposition and Teager energy operator (IVMD-TEO) is proposed for bearing fault diagnosis. The variational mode decomposition (VMD), it is an intrinsic, adaptive and quasi-orthogonal decomposition method, which can be applied to non-linear and non-stationary signal, VMD solve mode-mixing problem in decomposition result and has high precision and noise robustness. To determine the number of intrinsic mode function (IMF) adaptively, VMD is improved using the correlation coefficient criterion. Firstly, IVMD algorithm is used to decompose a multicomponent signal into a number of IMFs adaptively. Second, all the monocomponent signals' instantaneous amplitude and instantaneous frequency are demodulated via TEO, respectively, because TEO has fast and high precision demodulation advantages to monocomponent signal. Finally, the time-frequency representation of original signal is exhibited by superposing the time-frequency representations of all the monocomponents. The analysis results of simulation signal and public online dataset for bearing vibration data (Ottawa, Canada) demonstrate that the proposed method has perfect multicomponent signal decomposition capacity and good time-frequency expression. It is a promising time-frequency analysis method for rotor fault diagnosis.

**Keywords** – Fault diagnosis, vibration signal, variational mode decomposition, bearing

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## High Antioxidant Capacities and Anti-Inflammatory Effects of Hammada Elegans Botsch. Extracts : an in Vitro Assessment

Feriha BENSAFIDDINE<sup>1</sup>, Ibrahim ASSELI<sup>2</sup>, Ammar DJERIDANE<sup>3</sup> and Mohammed YOUSFI<sup>4</sup>

<sup>1</sup>Laboratoire des sciences fondamentales, Université Amar Telidji. PB 37G, 03000, Laghouat- Algérie.

<sup>2</sup>Plateau technique d'analyse physico-chimique, Université Amar Telidji. El khneg, 03000, Laghouat- Algérie

<sup>3</sup>Laboratoire des sciences chimiques et physiques appliquées, ENS de Laghouat, BP 403, Laghouat-Algérie.

[\\*farahbensafi@gmail.com](mailto:*farahbensafi@gmail.com)

**Abstract** – Plants supply traditional Algerian medicines for the treatment of antiinflammatory effect. The reasons for the use of traditional treatment were that pure compound obtained were also effective in reducing the toxicities of toxic agents or other drugs. In this study, we explore the phytochemical composition and the phenolic content by indirect method to evaluate the antioxidants and the anti-inflammatory capacities of twelve extracts from three plants. The total phenolic content ranged from  $0.168 \pm 0.020$  to  $4.166 \pm 0.124$  mg per gram of dry weight. Phytochemical screening revealed that tannins, C-heterosides, O-reduced heterosides and reducing compounds are the most common chemical groups. The highest antiradical activity was achieved with methanolic extract of Hammada elegans ( $EC_{50} = 0.551 \pm 0.171$ mg/mL). However, the acetonc extract of Hammada elegans represents the most important reducing activity ( $EC_{50} = 0.747 \pm 0.004$  mg/mL). Moreover, this extract also displays the highest chelating ferrous ions effect ( $EC_{50} = 5.749 \pm 0.009$  mg/mL) while the hydromethanolic extract of Cleome arabica has the best antilipoperoxidative effect ( $EC_{50} = 0.031 \pm 0.000$  mg/mL). Furthermore, all extracts inhibit the activity of lipooxygenase and cyclooxygenase with  $IC_{50}$  values less than  $19.210 \pm 0.297$  mg/mL. Therefore, the acetonc extract of Hammada elegans appears to be twice greater than that of standard inhibitors. The fractionation of the acetonc extract of Hammada elegans has given a potent bioactive compound which seems to have potential therapeutic possibilities for the prevention of the inflammatory effects.

**Keywords** – Anti-inflammatory effect, antioxidant capacity, Hammada elegans, isolation, phytochemical screening



## A Review on Thermal Insulation of Materials for Energy Efficiency of Buildings

Talha FAHIM AWAN<sup>1</sup>, Haider ABBAS<sup>2</sup> and Usman HUSSAIN<sup>3</sup>

<sup>1</sup>Civil Engineering Department, C.U.S.T, Pakistan

<sup>2</sup>Civil Engineering Department, C.U.S.T, Pakistan

<sup>3</sup>Civil Engineering Department, C.U.S.T, Pakistan

[\\*haiderjan1214@gmail.com](mailto:haiderjan1214@gmail.com)

**Abstract** – Thermal conductivity is currently assumed to be a constant value in the calculation of building energy consumption and load. However, when building materials are used, they are exposed to an environment with constantly changing temperatures and relative humidity. Materials' thermal conductivity will inevitably change with temperature and humidity, resulting in errors in estimating energy consumption in the building. Porous materials have attracted the attention of numerous researchers as a low-cost and viable means of enhancing building energy efficiency. The natural materials utilised in some building energy technologies are also permeable. However, there aren't any reviews of porous medium specifically related to building energy technology yet. In addition to a discussion of life-cycle analysis and potential emission reductions through the use of appropriate insulation materials, the goal of this study is to compile the most recent developments in building thermal insulation materials.

**Keywords** – Thermal Conductivity, Relative humidity, Temperature, Insulation materials, Energy efficiency

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## Nylosan Red Textile Dye Elimination by Adsorption Process: RSM Validation

Amel BELAYACHI-HADDAD<sup>1</sup>, Nouredine BENDERDOUCHE<sup>2</sup>, Benaouda BESTANI<sup>3</sup> and Chérif  
HADDAD<sup>4</sup>

<sup>1</sup>SEA2M Laboratory, University Abdelhamid Ibn Badis, Mostaganem, Algeria

<sup>2</sup>R&D, LHC DESIGN, Algeria

[\\*amel.belayachi@univ-mosta.dz](mailto:amel.belayachi@univ-mosta.dz)

**Abstract** – Textile wastewater removal requires a detailed study of numerous processing steps. The effectiveness of the electrocoagulation process used to remove a dye from wastewater was evaluated in this study. In this study, we evaluated response surface methodology (RSM) in the optimization of the degradation of N-2RBL Nylosan Red (NR) by adsorption process, using activated carbon made from artichoke leaves. A 2<sup>2</sup> full factorial design was employed to design runs and analyse the effects of three independent factors: pH (2-11), dose (0.5-4 g/L) and time (5-30 min), as well as the interaction factors on the reaction rate (%). According to the results, pH had the most significant impact on the removal efficiency of NR. The maximum dye removal efficiency of 97.31 % was achieved at optimum conditions.

*Keywords* – RSM, Experimental design, Nylosan Red, Adsorption, Activated Carbon, Optimization

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## Securing Communications in Robot Operating System

Jaafari HATIM<sup>1</sup>, Chahboun ASAAD<sup>2</sup> and Raissouni NAOUFAL<sup>3</sup>

<sup>1</sup>*Department of Mathematical-Physical Sciences and New Technologies, National School of Applied Sciences Tangier, Abdelmalek Essaadi University, Morocco*

<sup>2</sup>*Department of Mathematical-Physical Sciences and New Technologies, National School of Applied Sciences Tetouan, Abdelmalek Essaadi University, Morocco*

[\\*hatiminio@gmail.com](mailto:*hatiminio@gmail.com)

**Abstract** – In recent years, the development of robotics technology has given birth to a new generation of robotics software ROS (Robotic Operating System). At present, most autonomous research systems are built using the ROS framework, which it's distributed, and nodes publish information used by each other's.

Robot safety has always been a secondary or triple priority, making robots vulnerable to cyber-attacks. ROS is not just a post plugin, it is a widely used and popular open-source framework, and robots using this system are becoming more and more popular. However, it's vulnerable to network attacks.

This causes a serious threat because malicious processes can easily interrupt communication, read private messages, and even replace nodes who are basically one executable that represents a subprogram inside our ROS application. The aim of this research is to propose an architecture that uses an encryption and authentication engine to protect the system and to solve the most common ROS security problems. The result that we get, improve that the authentication adds negligible time in network delays but protect our system.

The advantage of the secure ROS architecture we provide that is no need to change the ROS software library and tools. It applies to all ROS client libraries and does not need to rebuild the node, therefore preventing man in the middle and hijacking attacks. We also conducted real-world experiments to evaluate the effectiveness of ROS security methods.

*Keywords – ROS, AES-128, POLY 1305, framework, encryption*

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## X-Ray Diffraction, Magnetic and Thermal Studies of the Mechanically Alloyed Fe-Co-Ni Powders

N. BENSEBAA<sup>1</sup>, M. BELDJEHEM<sup>2</sup>, S. ALLEG<sup>3</sup> and J.J. SUNOL<sup>4</sup>

<sup>1</sup>Laboratoire de Magnétisme et de Spectroscopie des Solides (LM2S), Département de Physique - Faculté des Sciences, Université Badji Mokhtar - Annaba - B.P. 12 (23000) - Algérie.

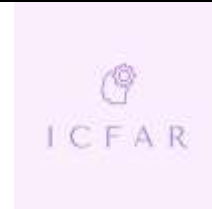
<sup>2</sup>Departament de Física, Universitat de Girona, Campus Montilivi, Girona 17071, Spain.

\*[n\\_bensebaa@yahoo.fr](mailto:n_bensebaa@yahoo.fr)

**Abstract** - Nanocrystalline Fe<sub>47.5</sub>Co<sub>50</sub>Ni<sub>2.5</sub> alloy powder was prepared by the mechanical alloying process in high-energy planetary ball mill P7 under an argon atmosphere. Structural, magnetic and thermal stability properties were investigated by using X-ray diffraction (XRD), vibrating sample magnetometer and differential scanning calorimetry, respectively. The results of the Rietveld refinement of the XRD patterns reveal the formation of three solid solutions: *bcc*  $\alpha$ -Fe type, *bcc* FeCo and *hcp* Co-type after 48 h of milling. The saturation magnetization and coercivity are of about 179.66 emu/g and 117.74 Oe, respectively. According to the *Mr/Ms* squareness ratio values, the ball-milled samples fall into the multidomain. The addition of 2.5wt.%Ni lowers the disordered-to-ordered ( $T\alpha \rightarrow \alpha'$ ) and  $\alpha \rightarrow \gamma$  ( $T\alpha \rightarrow \gamma$ ) phase transformation temperatures.

**Keywords** – Nanostructure, Fe-Co-Ni alloy, X-ray diffraction, VSM, Differential scanning calorimetry

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## Visible Light Communication and Li-Fi Technology for Audio Transmission

Abdelmoula AHMED<sup>1</sup>, L'antri IBRAHIM<sup>2</sup> and Dehache KAWTHER<sup>3</sup>

<sup>1</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>2</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>3</sup>Electrical Engineering Department, Mohamed boudiaf (usto-mb) University, oran, Algeria

[\\*ahmed.abdelmoula.etu@univ-mosta.dz](mailto:ahmed.abdelmoula.etu@univ-mosta.dz)

**Abstract** – Light Fidelity (Li-Fi) technology has been developed to transmit music data via Visible Light Communication (VLC). The goal of this project is to create a method for data transfer that is both quicker and more secure. The two main short-range wireless technologies utilized today for various wireless applications are Bluetooth and Wi-Fi. These modern technologies have a number of drawbacks, including greater costs, increased power consumption, and data security. The need for a technology that can overcome all the drawbacks of existing technology is therefore significant. An effective substitute that is emerging is VLC. This new technology transmits information via light. Li-Fi, which has a spectrum 10 thousand times larger than the radio wave spectrum, controls the visible light spectrum. transmits information by visible light rather than conventional radio waves. As a result, it can be utilized in locations where radio waves are restricted. Light is a source for high-speed communication demands due to its extremely high speed (3 to 108 meter/second). Light always travels in a straight line, but atmospheric changes cause the light to be deflected. With the 300 THz of potential bandwidth for VLC, many gigabits of data per second over a small distance might be given. Here, a VLC prototype with an improved channel capacity and a much longer transmission distance is being created. This prototype gives an overview of audio transmission in VLC. This research suggests a real-time audio broadcast prototype using readily available Light Emitting Diode (LED) bulbs. According to experimental results, real-time audio may be provided at a distance of up to 2 feet by strategically placing LED sources and utilizing concentration-improving effects. The lighting model is created and recreated within the context of the space, and it demonstrates a close link between the placement of the light sources and the distribution of illumination.

*Keywords* – Acoustic, Audio, Optical, Optoacoustic, Li Fi

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## Limited Laboratory Environment for the Use of Optical Methods for Audio Signal Transmission

Abdelmoula AHMED<sup>1</sup>, L'antri IBRAHIM<sup>2</sup> and Dehache KAWTHER<sup>3</sup>

<sup>1</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>2</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>3</sup>Electrical Engineering Department, Mohamed boudiaf (usto-mb) University, oran, Algeria

[\\*ahmed.abdelmoula.etu@univ-mosta.dz](mailto:ahmed.abdelmoula.etu@univ-mosta.dz)

**Abstract** – The technique for designing an indoor visible light communication system that can send audio signals using light beams over short distances is presented in this paper. A relatively recent technique called Visible Light Conversation (VLC) uses light sources to send data during communication. Both analog and digital signal transmission are conceivable in all communication systems, however digital communication systems are far more common than analog ones since they can provide a faithful quality of signal regeneration after the transmission process. The procedure of digital communication was also used in the current project. Pulse Width Modulation (PWM) was employed as the signal encoding technique to transform the analog audio signal into the digital transmission signal and vice versa. As the source of light, To achieve increased signal power and sensitivity, white Light Emitting Diodes (LEDs) were employed as photo sensors instead of photodiodes. The carrier signal for transmission in the system was chosen to have a frequency of 50 KHz. The audio stream was memodulated at the receiving end using a 4th order Butterworth lowpass filter with an 8 KHz cutoff frequency. The indoor transmission range of this visible light communication system was discovered to be 5 meters using only two white LEDs while generating good audio quality.

**Keywords** – Visible Light Communication System, Analog, Digital, Pulse Width Modulation, Solar Cell, Photodiode, Carrier Signal, Butterworth low pass Filter, Cuttoff Frequency

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## Design of an Indoor Visible Light Communication Link for an Audio Transmission System

Abdelmoula AHMED<sup>1</sup>, L'antri IBRAHIM<sup>2</sup> and Dehache KAWTHER<sup>3</sup>

<sup>1</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>2</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>3</sup>Electrical Engineering Department, Mohamed boudiaf (usto-mb) University, oran, Algeria

[\\*ahmed.abdelmoula.etu@univ-mosta.dz](mailto:ahmed.abdelmoula.etu@univ-mosta.dz)

**Abstract** – The technique for designing an indoor visible light communication system that can send audio signals using light beams over short distances is presented in this paper.

A relatively recent technique called Visible Light Conversation (VLC) uses light sources to send data during communication. Both analog and digital signal transmission are conceivable in all communication systems, however digital communication systems are far more common than analog ones since they can provide a faithful quality of signal regeneration after the transmission process. The procedure of digital communication was also used in the current project. Pulse Width Modulation (PWM) was employed as the signal encoding technique to transform the analog audio signal into the digital transmission signal and vice versa. As the source of light, To achieve increased signal power and sensitivity, white Light Emitting Diodes (LEDs) were employed as photo sensors instead of photodiodes. The carrier signal for transmission in the system was chosen to have a frequency of 50 KHz. The audio stream was memodulated at the receiving end using a 4th order Butterworth lowpass filter with an 8 KHz cutoff frequency. The indoor transmission range of this visible light communication system was discovered to be 5 meters using only two white LEDs while generating good audio quality.

**Keywords** – Visible Light Communication System, Analog, Digital, Pulse Width Modulation, Solar Cell, Photodiode, Carrier Signal, Butterworth low pass Filter, Cuttoff Frequency

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## Audio Processing for Visible Light Communication from Sound to Light

Abdelmoula AHMED<sup>1</sup>, L'antri IBRAHIM<sup>2</sup> and Dehache KAWTHER<sup>3</sup>

<sup>1</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>2</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>3</sup>Electrical Engineering Department, Mohamed boudiaf (usto-mb) University, oran, Algeria

[\\*ahmed.abdelmoula.etu@univ-mosta.dz](mailto:*ahmed.abdelmoula.etu@univ-mosta.dz)

**Abstract** – Phones may exchange messages with low-complexity Visible Light Communication (VLC) networks via their cameras and flashlight Light Emitting Diodes (LEDs), however these interfaces impose severe limitations when utilized in a VLC network. We will explore how to expand mobile phones or tablets with a tiny peripheral device that is battery-free, utilizes just passive components, and provides VLC capabilities at the needed data rate in this article (kilobit per second). This gadget connects to the audio jack, and on-board audio signal processing creates and decodes the outgoing light signals. The gadget is powered by the audio jack output signal from the phone, thus no additional battery is necessary. An LED's light outputs are directly modulated by audio signals. Incoming light is detected by a photodiode and the generated electrical signals are fed into the microphone input. This simple device enables use of existing communication protocols and therefore makes it possible to integrate mobile phones or tablets into existing VLC LED-toLED networks. Limited Laboratory Environment for the Use of Optical Methods for Audio Signal Transmission In this paper, we will look at the options for transferring audio signals using optical and optoacoustic technologies. There will be an examination of existing approaches as well as the benefits of sending audio signals using optical means. A model of a Li-Fi system for transferring audio signals is studied, as is the construction of one with the fewest electrical parts. This is to execute the system given in the laboratory sessions in front of students, as well as to provide them the chance to develop such systems as a practical exercise and to evaluate the possibilities for sending audio signals using optical means.

*Keywords* – Acoustic, Audio, Optical, Optoacoustic, Li Fi

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## A Sound Transmission System Based on Visible Light Communication

Abdelmoula AHMED<sup>1</sup>, L'antri IBRAHIM<sup>2</sup> and Dehache KAWTHER<sup>3</sup>

<sup>1</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>2</sup>Electrical Engineering Department, Abdelhamid Ibn Badis University, Mostaganem, Algeria

<sup>3</sup>Electrical Engineering Department, Mohamed boudiaf (usto-mb) University, oran, Algeria

[\\*ahmed.abdelmoula.etu@univ-mosta.dz](mailto:*ahmed.abdelmoula.etu@univ-mosta.dz)

**Abstract** – In this research, we suggest a visible light communication-based analog voice transmission system (VLC). The analog audio signals of the system is converted into a frequency signal that is linear in amplitude at the transmitter by the VoltageFrequency (V-F) conversion circuit. The Frequency-Voltage (F-V) converter circuit may demodulate the speech signal at the receiver.

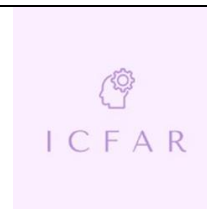
The test of the voice transmission system based on visible light communication is finally conducted, and the results demonstrate that the input and output waveforms are consistent and the transmitted speech can be heard clearly when received. The test results demonstrate the viability and accuracy of the design.

Keywords—VLC; voice transmission sytem; V-F converter; F-V Converter Design and Development a Visible Light Communication prototype for Audio Data Transmission Technology advancements have created new communication infrastructure that is suitable for sending audio data.

Numerous wired and wireless communication channels serve as proof of this. As a result, it suggests novel techniques for transmitting audio data, one of which is VLC (VLC). VLC is a communication system that uses the visible light wave spectrum, which ranges from 375 nm to 780 nm, to send and receive data. In this study, acoustic data transfer makes use of the LED light's brightness. An LED component is used by the transmitter and receiver as a transducer, which is subsequently supplied to the data processing circuit. The audio amplifier circuit is next received from the data processing circuit. The test results demonstrate that this system is capable of transmitting audio data. The LED color test indicates that the output voltage of Green, which is 1.32 Volt, is the highest. The photodiode's maximum detectable angle is 70°, with a recorded voltage of 100mV and an associated sound intensity of -32.541dB.

*Keywords – VLC, LED, Communication, Audio*

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## Synthesis The Biocomposite Cellulose/Zinc Oxide Nanocomposite (CNC/ZnO NPs )

**TEREA Hafidha· SELLOUM Djamel and REBAI Abdelkerim**

*Département Génie des Procédés, Université kasdi merbah-Ouargla, Algeria,.*

*Département Génie des Procédés, Université kasdi merbah-Ouargla, Algeria,*

*Département chimique, Université d'Echahid Hama Lakhdar - El-Oued , Algeria,*

*[terea.hadile88@gmail.com](mailto:terea.hadile88@gmail.com), [selloumdjamel@gmail.com](mailto:selloumdjamel@gmail.com), [new.rebiai@gmail.com](mailto:new.rebiai@gmail.com)*

**Abstract** – This work aims to recycle plant residues and use them as a renewable wealth to produce raw materials from a local source, as we used the peanut shells to extract cellulose and convert it to nanocrystalline cellulose. Then the Sol-Gal method was used to Synthesis ZnO particles on cellulose, thus forming the nanocomposite cellulose/ZnO. The obtained results confirmed the effectiveness of the synthesis of cellulose/ZnO NPs through characterization by FTIR to determine the chemical functions of the resulting nanocomposite and the size and shape of the nanocomposite were also determined by X-ray diffraction and electron microscopy, respectively.

*Keywords – peanut shells , cellulose , ZnO , Nanocomposite and characterized.*

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## New Ternary Cement Combinations From Algerian Renewable Raw Materials To Reduce Acid Attack

Abdelkadir Belghit, Nasr Eddine Bouhamou, Sid Ahmed Bekhti , Sallai Hind Hidayet and Belkacem  
Ziregue

*Abd el Hamid Ibn Badis University (UMAB), Faculty of Science and Technology, Laboratory of Materials and Construction  
Process (LMPC), belhacel street 27000, Mostaganem, Algeria,*

*Bayadh University Center, Department of Civil Engineering, Bayadh, Algeria*

*dr.abdelkadir.belghit@gmail.com*

**Abstract** – Reducing the amount of clinker in cement industry through the use of Supplementary Cementitious Materials (SCMs) is a short-term solution developed by researchers in our field to meet the challenge of sustainable development, In the same context, the present work aims to test the new combinations using two types of Algerian SCMs (calcined dam mud and natural pouzzolan) and to evaluate their behaviour when exposed to hydrochloric acid. To concretise this objective, we produced a control mortar (based on CEMI cement) and nine other mortars containing modified cements, through binary and ternary mixtures of Portland Cement CEMI, Calcined Dam Mud and Natural Pouzzolana, All these mixtures were tested in the hardened state for compressive strength and microstructural examination of the mortars. The ten mixtures were then immersed in 5% hydrochloric acid (HCL) for fifteen weeks (105 days), Then they were examined for mass loss and the visual appearance. The results obtained in the majority of tests showed that the mixtures containing SCMs especially the ternary mixtures are more advantageous than others and characterized by a lower porosity and a better behavior after both compressive and HCl attack.

*Keywords – Cement, Mortar, Natural Pouzzolana, Calcined dam's mud, Hydrochloric acid.*

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## Relationship Between Density And Thermal Properties Of Lightweight Blocks Made With Raw Earth Stabilized And Incorporating Expanded Polystyrene EPS Beads

Safa Layachi, Bachir Taallah, Ouarda Izemmourena, Maroua Layachi, and Abdelhamid Guettala

*Department of Civil Engineering and Hydraulic/ Civil Engineering Research Laboratory, University of Biskra, Algeria  
Laboratory of Development in Mechanics and Materials, University of Djelfa, 17000 Djelfa, Algeria*

[safa.layachi@univ-biskra.dz](mailto:safa.layachi@univ-biskra.dz)

**Abstract** – The high cost of energy consumption has pushed people to look for other materials with significant thermal insulation. The objective of this investigation is to study the relationships between bulk density and thermal properties such as thermal conductivity, thermal effusivity, and volumetric heat capacity of lightweight blocks (LWB) made of raw earth, stabilized with lime, and mixed with expanded polystyrene (EPS). It was found that the soil used in this study required an optimum lime content of 10% by weight to achieve the optimum mechanical properties. In this context, different contents of expanded polystyrene (EPS) beads (0, 40, 45, 50, 55, 60, 65% by volume) were added. The results of this study showed that the thermal properties of LWB decreased with decreasing bulk density. An improvement of 57.36% in thermal conductivity in the case of 65% EPS content compared to the control block was recorded.

*Keywords* –lightweight blocks (LWB), raw earth, expanded polystyrene beads (EPS), bulk density, thermal properties.

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## Classification of Mammography Images Using Bag of Features Model

Sarah Benmazou

*Badji Mokhtar – Annaba University- B.P.12, Annaba, 23000 Algeria LRI Laboratory*

*sarah.benmazou@univ-annaba.org*

**Abstract** – The BoF model is a tool widely used in the fields of classification and image search, its popularity is largely based on its simplicity. As part of our work we will be interested in an image classification mammography based on the BOF model with SVM algorithm application and the SIFT descriptor. These algorithms show performance, the results have been compared with other algorithms. In the first phase, the SVM was used to compare the result with the MLP. In the same work, two SIFT and ORB descriptors were used. To assess the effectiveness of the proposed work, the classification rate (Accuracy) and the precision rate were calculated. The best classification rates are obtained by applying the MLP algorithm and using the SIFT descriptor on the base images (Ultra Sounde Brest Images Dataset) with a rate of 86% a small increase compared to SVM with a rate equal to 84%. Accuracy rate with 80% for MLP and 74% for SVM respectively.

*Keywords – Bag of features Models, Gks method, SIFT descriptor, SVM algorithm, MLP method.*

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## Ultrasound Physical Modification Of Activated Carbon From Hydrogen Peroxide : An Optimization Study On Removal Of Cationic Dye

Mourad Termoul, Salima Attouti, Mokhtar Benzekri Benallou, Anissa Zerhouni, Zohra Mekibes, Nourddine Benderdouche, Benaouda Bestani

Laboratoire SEA2M, Université Abdelhamid Ibn Badis-Mostaganem, Mostaganem, 27000, Algérie.

[termoulmourad80@yahoo.fr](mailto:termoulmourad80@yahoo.fr)

**Abstract-** Surface modification of the commercial activated carbon from Merck, using both ultrasound at the low frequency of 40 kHz and chemical treatment using H<sub>2</sub>O<sub>2</sub> (35%) solution for the removal by adsorption of methylene blue a cationic dye was the aim of this work. The obtained activated carbons were characterized by molecular iodine for microporous texture and methylene blue for mesoporous one showed that activated carbon treated under the effect of ultrasonic waves presents an increased porosity compared to the treated samples. The influence of different experimental parameters influencing the removal rate of methylene blue such as the dose of the adsorbent, the pH, the contact time and the initial concentration was also studied. The modification by H<sub>2</sub>O<sub>2</sub> under ultrasound was considerably more effective in enhancing the adsorption of methylene blue for up to 66% at pH=5.5. Adsorption capacities of methylene blue by CA-H<sub>2</sub>O<sub>2</sub> (treated activated carbon) and CA-NT (untreated activated carbon), are 1008 mg/g and 335 mg/g respectively. This enhancement can be explained on the one hand by surface modification favoring then the interaction of methylene blue and the carbon surface, and on the other hand by an increase in the adsorbate transfer without any influence on the particle size leading to a slight increase in the external surface and a better access to the pores. Isotherm studies showed that the non-linear Langmuir model describes well the process of methylene blue adsorption on samples modified under ultrasonic effect.

*Keywords: ultrasound, activated carbon, modification, adsorption, cationic dye.*

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## On The Importance Of Photocatalytic Degradation Tto Remove The Basic Dye 46 uUnder UV Radiation

Amel Hamadi, Hiba Kais , Nacera Yeddou-Mezennere and Zohra Bensaadi

*Laboratory of Engineering of Reaction, Faculty of Mechanical Engineering and Process Engineering,  
University of Science and Technology Haouari Boumadien, Beb-Ezzaouar, 16024, Algeria.*

[amelhamadi1985@gmail.com](mailto:amelhamadi1985@gmail.com)

**Abstract** – Today, semiconductor nanomaterials are used extensively as an effective photocatalyst for organic compound degradation. The main challenge in this study is to use this semiconductor to remove one of the most recalcitrant cationic dyes "BR46". The purpose of this work is to use the technique of photocatalytic degradation to remove this basic dye from an aqueous solution. Photo-catalytic degradation of BR46 was studied under UV radiation with zinc oxide (ZnO) as a semi-conductor. The effect of the initial dye concentration, pH of the solution and catalyst concentration was investigated. And it was found that the visible light absorption of ZnO photo-catalyst was increased by more than 99% of the degradation with the mild operating condition, 240 min absorption time, pH 5.8, photo-catalyst dose 0. 5g, BR46 concentration 10mg/L of photo-catalytic reaction. The kinetic study also reacted to follow the pseudo-second-order of Langmuir Hinshelwood model.

*Keywords – Photo-catalytic degradation, Basic dye 46, ZnO, UV radiation.*

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## First-Principles Phonon And Boltzmann Calculations For a New Semiconductor Full Heusler Li<sub>2</sub>BeX

Houari Mohammed, Bouadjemi Bouabdellah , Mesbah Smain, Lantri Tayeb, Matougui Mohamed, Akham  
Amel Bentata Samir

*Ahmed Zabana University of Relizane 48000, Algeria*

*Laboratory of Technology and of Solids Properties, University of Mostaganem*

*Laboratory Physico-chemistry of Advanced Materials, University of Djillali Liabes, Sidi- Bel- Abbas, Algeria*

*Laboratory of Quantum Physics of Matter and Mathematical Modelling (LPQ3M), Mustapha Stambouli University of Mascara  
29000, Algeria  
[mhhoua@gmail.com](mailto:mhhoua@gmail.com)*

**Abstract** -In the framework of the density functional theory (DFT), using the Full Potential Linearized Augmented Plane Wave Method (FP-LAPW) implemented in the Wien2k program, the structural, electronic, mechanical and thermoelectric properties of full Heusler alloys Li<sub>2</sub>BeX (X= Si, Ge and Sn) were explored. The exchange and correlation potential are treated by different approximations: the generalized gradient approximation with Perdew–Burke–Ernzerhof scheme (GGA-PBE) and Tran–Blaha modified Becke–Johnson (mBJ-GGA). The results achieved for the electronic properties show that these compounds are semiconductor in nature with an indirect band gap, of values: 0.60eV, 0.55eV and 0.24eV for Li<sub>2</sub>BeSi, Li<sub>2</sub>BeGe and Li<sub>2</sub>BeSn respectively. In addition, these materials are mechanically stable owing to the fact that the conditions required for this mechanical stability satisfy Born's criteria, and are of a brittle nature due to the calculated values of the ratios (B/G), on the other hand, these compounds are dynamically stable due to the non-presence of negative frequencies following the detailed study of phonons. These compounds are characterized by a high figure of merit (ZT) (close to unity) and a high Seebeck (S) coefficient, making them promising candidates for thermoelectric applications.

*Keywords: Full Heusler, Wien2k, Seebeck coefficient, half-metallicity.*

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## High Absorption Coefficient In Full Heusler Compounds, Insight Into The Optical Properties Of Li<sub>2</sub>CaC and Li<sub>2</sub>SrC

Mesbah Smain, Houari Mohammed, Lantri Tayeb, Bouadjemi Bouabdellah, Akham Amel, Zitouni Ali, Haid Slimane

*Ahmed Zabana University of Relizane 48000, Algeria*

*Laboratory Physico-chemistry of Advanced Materials, University of Djillali Liabes, Sidi- Bel- Abbes, Algeria*

*Laboratory of Technology and of Solids Properties, University of Mostaganem*

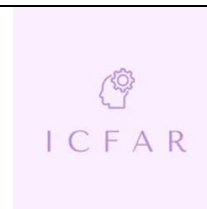
*Faculty of Sciences and Technology, Tissemsilt University, 38004, Algeria.*

[smail.mesbah@univ-relizane.dz](mailto:smail.mesbah@univ-relizane.dz)

**Abstract-** Structural, electronic, elastic and optical properties of full Heusler compounds Li<sub>2</sub>CaC and Li<sub>2</sub>SrC were studied; using the full potential linearized augmented plane wave method based on the density functional theory, implemented in the Wien2k package. The exchange and correlation potential is treated by the generalized gradient approximation GGA and Trans-Blaha-modified Becke–Johnson. We have found that the structure of Cu<sub>2</sub>MnAl-type has more stable energy than the one of Hg<sub>2</sub>CuTi-type for both compounds studied. These compounds have semiconductor behavior with a direct band gap at  $\Gamma$ - $\Gamma$  direction with values of 1.127 eV and 0.979 eV for Li<sub>2</sub>CaC and Li<sub>2</sub>SrC respectively. The calculated formation and cohesive energies are all negative, which exhibit that these alloys have a good chemical stability. The optical properties shows a high absorption coefficient, which gradually increases from  $7 \times 10^4 \text{cm}^{-1}$  to  $39 \times 10^4 \text{cm}^{-1}$  through the visible domain of light, and the high reflectivity which exceeds 30% in the visible domain of light for both compounds, allowing the useful of these full Heusler materials in optoelectronic applications, including solar and photovoltaic cells. Although, no available theoretical or experimental results for these compounds to compare it with our findings. We hope that this study can pave the way for experimental or theoretical research in the future.

*Keywords: Full Heusler, Wien2k, Semiconductor, optic.*

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## Improvement Of Optical And Photoelectrochemical Properties Of Manganese Oxide By Incorporation Of Graphene Nanoparticles

Assia Tounsi & Leila Lamiri & Noudjoud Houas & Farid HABELHAMES & Ahmed BAHLOUL

*Laboratoire d'Electrochimie et Matériaux (LEM), Département de Génie des Procédés*

*Research Center in Industrial Technologies CRTI, P.O. Box 64, Cheraga 16014, Algiers, Algeria*

*Laboratory of Electrochemistry of Molecular Materials and Complex (LEMMC). Department of Process Engineering, Faculty of Technology, University of Ferhat ABBAS Setif-1, El-Mabouda campus, 19000 Sétif, Algeria*

*<sup>3</sup>Department of Chemistry, Faculty of Science, University Ferhat Abbas Setif-1, Setif 19000, Algeria*

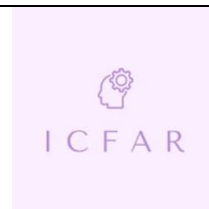
*<sup>4</sup>Département de Génie de L'Environnement, Faculté Des Sciences Et de La Technologie, Université Mohamed El Bachir El Ibrahim, 34000 El Anceur, Algeria*

[tounsiimene93@yahoo.com](mailto:tounsiimene93@yahoo.com)

**Abstract-** Supercapacitors have been one of the highest potential candidates for energy storage because of their significant advantages beyond rechargeable batteries in terms of large power density, short recharging time, and long cycle lifespan. In this work, hybrid materials based on MnO<sub>2</sub> and GR were prepared by chronoamperometry technique. The properties of materials were characterized by x-ray diffraction, IR- spectroscopy, scanning electron microscopy and microscopy and Impedance Spectroscopy, cyclic voltammetry, galvanostatic charge-discharge. Electrochemical investigation indicates that the FTO/MnO<sub>2</sub> by pulsed electrodeposition composite possess an excellent performance toward in supercapacitors

*Keywords electrodeposition ; Graphene; MnO<sub>2</sub> ; materials composite. electrochemical behavior, supercapacitors*

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## Facile Synthesis Of Ferns-Like PbTh-silver As Binder-Free Faradic Electrodes For Supercapacitors With Improved Electrochemical Properties

Assia Tounsi & Leila Lamiri & Noudjoud Houas & Farid HABELHAMES & Ahmed BAHLOUL

*Laboratoire d'Electrochimie et Matériaux (LEM), Département de Génie des Procédés*

*Research Center in Industrial Technologies CRTI, P.O. Box 64, Cheraga 16014, Algiers, Algeria*

*Laboratory of Electrochemistry of Molecular Materials and Complex (LEMMC). Department of Process Engineering, Faculty of Technology, University of Ferhat ABBAS Setif-1, El-Mabouda campus, 19000 Sétif, Algeria*

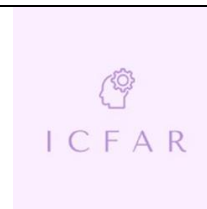
*Department of Chemistry, Faculty of Science, University Ferhat Abbas Setif-1, Setif 19000, Algeria*  
*Département de Génie de L'Environnement, Faculté Des Sciences Et de La Technologie, Université Mohamed El Bachir El Ibrahim, 34000 El Anceur, Algeria*

[tounsimene93@yahoo.com](mailto:tounsimene93@yahoo.com)

**Abstract-** Supercapacitors have been one of the highest potential candidates for energy storage because of their significant advantages beyond rechargeable batteries in terms of large power density, short recharging time, and long cycle lifespan. In this work, PbTh-Silver (Ag) with uniform ferns-like structure have been successfully obtained via an electrochemical deposition on FTO substrate by two-step. Materials composite were measured by using X-ray diffraction (XRD), and field emission scanning electron microscopy (FESEM) to investigate the structure and morphology. Further electrochemical characterizations revealed that the specific capacitance of samples prepared. These findings suggest that the PbTh-Silver(Ag) /FTO electrode is a promising candidate for excellent electrochemical capacitors.

*Keywords electrodeposition ; PbTh; silver ; materials composite. electrochemical behavior, supercapacitors*

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## Optical Properties And FTIR Studies Of MnO<sub>2</sub> Doped Graphene Nanoparticles By Simple Electrodeposition Method

Assia Tounsi & Leila Lamiri & Noudjoud Houas & Farid HABELHAMES & Ahmed BAHLOUL

*Laboratoire d'Electrochimie et Matériaux (LEM), Département de Génie des Procédés*

*Research Center in Industrial Technologies CRTI, P.O. Box 64, Cheraga 16014, Algiers, Algeria*

*Laboratory of Electrochemistry of Molecular Materials and Complex (LEMMC). Department of Process Engineering, Faculty of Technology, University of Ferhat ABBAS Setif-1, El-Mabouda campus, 19000 Sétif, Algeria*

*Department of Chemistry, Faculty of Science, University Ferhat Abbas Setif-1, Setif 19000, Algeria*

*Département de Génie de L'Environnement, Faculté Des Sciences Et de La Technologie, Université Mohamed El Bachir El Ibrahim, 34000 El Anceur, Algeria*

[tounsimene93@yahoo.com](mailto:tounsimene93@yahoo.com)

**Abstract-** In this study, pure and graphene doped MnO<sub>2</sub> nanoparticles. Different techniques have been utilized in fabricating novel nanocomposites of manganese dioxide (MnO<sub>2</sub>) and Graphene (GR) for capacitance enhancement are synthesized by simple electrodeposition method and doping effect of Graphene on the optical properties MnO<sub>2</sub> nanoparticles is studied at room temperature to enhance properties by varying electrons of appropriate concentration. We find that the electrons of appropriate concentration can enhance the optical properties.

In the composite, MnO<sub>2</sub> is expected to allow uniform GR particle dispersion and convenient electron transfer. In the present study, the formation mechanism and the electrochemical capacitive performance of the composites have been investigated.

*Keywords – MnO<sub>2</sub>; Graphene; nanoparticles; electrodeposition method.*

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## Structural, Elastic, And Electronic Properties Of LiAlSi Half-Heusler Compound Under Hydrostatic Pressure

K. Djennane, N. Dehimi, M. Dehbaoui

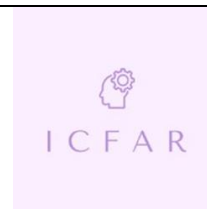
*Laboratoire de Physique des Techniques Experimentales et ses Applications, University of Medea, Algeria*

*khaoulakhaoula199817@gmail.com*

**Abstract** – In this study, we have investigated the structural, elastic, and electronic properties of Half-Heusler LiAlSi compound using a pseudopotential plane-wave method based on the density functional theory. The exchange correlation effect has been treated by implementing the generalized gradient approximation GGA-PBEsol in the CASTEP code. Our calculations demonstrate that the obtained lattice constant is in excellent agreement with experimental results. Furthermore, we have examined the pressure effect on the structural, electronic and elastic properties of the material. We have also analyzed the elastic constants and confirmed the mechanical stability of the monocrystalline phase of LiAlSi. Our results indicate that LiAlSi is both mechanically and dynamically stable. Moreover, we have evaluated independent single-crystal elastic properties, including bulk modulus, shear modulus, Young's modulus, Debye temperature, sound velocity, and universal index, which suggest that the material is brittle, stiff, and has a high Debye temperature, as well as being elastically anisotropic. Additionally, our calculations show that the Poisson's ratio is lower than 0.5, which suggests that a significant volume change can be associated with elastic deformation. We have also computed the electronic band structures, total (TDOS), and partial (PDOS) electronic density of states. Our findings reveal that LiAlSi is not spin polarized and exhibits semiconductor behavior, with an indirect band gap of 0.048 eV at 0 GPa.

*Keywords* – Heusler compound; Density Functional Theory; GGA-PBEsol; Structural properties; Elastic Properties; Electronic Properties.

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## Electro-Synthesis, Characterization And Capacitive Performance Of FTO/Polybithiophene- Ag Composite

Assia Tounsi & Leila Lamiri & Noudjoud Houas & Farid HABELHAMES & Ahmed BAHLOUL

*Laboratoire d'Electrochimie et Matériaux (LEM), Département de Génie des Procédés*

*Research Center in Industrial Technologies CRTI, P.O. Box 64, Cheraga 16014, Algiers, Algeria*

*Laboratory of Electrochemistry of Molecular Materials and Complex (LEMMC). Department of Process Engineering, Faculty of Technology, University of Ferhat ABBAS Setif-1, El-Mabouda campus, 19000 Sétif, Algeria*

*Department of Chemistry, Faculty of Science, University Ferhat Abbas Setif-1, Setif 19000, Algeria*

*Département de Génie de L'Environnement, Faculté Des Sciences Et de La Technologie, Université Mohamed El Bachir El Ibrahimi, 34000 El Anceur, Algeria*

[tounsiimene93@yahoo.com](mailto:tounsiimene93@yahoo.com)

**Abstract** -Silver is synthesized by reduction reaction of Silver nitrate with Lithium perchlorate. The silver (Ag) particles are used to prepare composite films containing Polybithiophene (PbTh) on Fluor tin oxide (FTO) glass substrates. The as-prepared FTO/PbTh-Ag sample has been characterized using X-ray diffraction, scanning electron microscopy and Impedance Spectroscopy, cyclic voltammetry, galvanostatic charge-discharge. The micrographs revealed that the deposited film of silver nanoparticles is homogeneous and exhibits ferns-like microstructure. Electrochemical investigation indicates that the FTO/PbTh-Ag composite possess an excellent performance toward in supercapacitors

**Keywords** – Polybithiophene Silver nanoparticles Electrodeposition Composite film Supercapacitors

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## Ab-Initio Investigation Of Structural, Electronic And Elastic Properties Of New Heusler Alloys CoMSn (M=Ru,Y)

S. Sefir, S.Terkhi , N. Mehtougui <sup>2</sup>, A.Zitouni , Z.Aziz and B.Bouadjemi

*Laboratory of Technology and Solid Properties LTPS, Faculty of Sciences and Technology, BP 227 Abdelhamid Ibn Badis  
University, Mostaganem 27000 Algeria*

*Laboratory of Elaboration and Characterization Physical Mechanics and Metallurgical of Material ECP3M, Faculty of  
Sciences and Technology, BP227 Abdelhamid Ibn Badis University, Mostaganem 27000, Algeria*

[sefiryamina@hotmail.fr](mailto:sefiryamina@hotmail.fr)

**Abstract** – First-principles calculations are performed to investigate the structural, electronic, and elastic properties of the half-Heusler alloys CoMSn (M=Ru,Y) in three phases (A, B and C phases) by using the full-potential linearized augmented plane wave (FP-LAPW) [1] as implemented in the WIEN2k [2] code based on the density functional theory (DFT), within the (GGA) and (GGA-mBj). From the structural properties, we have calculated the equilibrium lattice constants, the bulk modulus and the pressure derivative of the bulk modulus and the total energy as functions of the volume for the three phases (A,B and C). We have found that all the compounds are most stable in the phase C, and have a ferromagnetic state at optimized lattice constants. Also, we have calculated the electronic properties of the two half-Heusler alloys and shown that all the compounds have metallic characters. The elastic constants, such as the shear modulus, Young's modulus, anisotropy factor and Poisson's ratio, have been obtained and demonstrate that the compounds are ductile, anisotropic and stiff.

*Keywords: cubic ferromagnetic half-Heusler, FP-LAPW method, electronic structure, elastic properties.*

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## Preparation, Characterization And Mechanical Testing Of Chitosan/TiO<sub>2</sub> Film Nanocomposite

Debaa SOUMIA, Bouzid KHADIDJA, Khane YASMINA, Hafsi ZOULIKHA and Chaibi WAHIBI

*Université de Ghardaia, BP 455, Ghardaia, Algeria*

*Scientific and Technical Research Center in chemistry and physical- Analysis Bousmail RP 42415, Algeria.*

*yasminekhane@yahoo.fr*

**Abstract** – Chitosan/TiO<sub>2</sub> film nanocomposites have gained attention due to their potential applications in various fields, including biomedical engineering, food packaging, and environmental remediation. In this article, the nanocomposites thin films were prepared by mixing chitosan and TiO<sub>2</sub> nanoparticles using casting method. The prepared films were characterized for their morphology, crystallinity, and thermal stability using various techniques such as scanning electron microscopy, X-ray diffraction, and thermogravimetric analysis. The results showed that the chitosan/TiO<sub>2</sub> film nanocomposites had a uniform morphology and good thermal stability. The mechanical properties of the nanocomposites were investigated using tensile strength and Young's modulus measurements. The results showed that the addition of TiO<sub>2</sub> nanoparticles improved the mechanical properties of the chitosan films significantly. The tensile strength and Young's modulus of the nanocomposite films increased with increasing TiO<sub>2</sub> content. The chitosan/TiO<sub>2</sub> film nanocomposites were also explored for their antibacterial activity against gram negative bacteria *Escherichia coli* and gram positive bacteria *Staphylococcus aureus* under visible light irradiation. The nanocomposites exhibited good antibacterial activity, indicating their potential application in the development of antibacterial food packaging materials.

*Keywords – Chitosan, TiO<sub>2</sub>, casting method, film, mechanical properties, antibacterial activity.*

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## Preparation, Characterization And Application Of PbS/ZnO Thin Films

Fekhar Ahmed Moncef , Babenette Lokman, Djaber Aouf , Fenniche Fares and Khane Yasmina

*Université de Ghardaia, BP 455, Ghardaia, Algerie  
University of Kasdi Merbah, 30000 Ouargla – Algeria.*

*yasminekhane@yahoo.fr*

**Abstract** – PbS/ZnO thin film on a glass substrate was prepared by spin-coating method and characterized using UV-Vis spectroscopy, X-ray diffraction, Fourier-transform infrared spectroscopy, and scanning electron microscopy. The results confirmed the formation of pure ZnO nanoparticles with a hexagonal wurtzite crystal structure. The photocatalytic activity of PbS/ZnO was tested under UV irradiation using a batch method by its ability to degrade methylene blue, a toxic organic dye. The study also examined the effect of various factors on the photocatalytic degradation of methylene blue, including initial concentration, pH, and temperature. The results indicated that the PbS/ZnO thin film had good crystallinity and exhibited high transmittance in the visible region. The results demonstrated that the PbS/ZnO thin film exhibited excellent photocatalytic activity of methylene blue under varying conditions, and achieved a degradation rate of 97% within 30 minutes of UV irradiation. The findings of this study suggest that the ZnO nanoparticles thin film is a promising material for the photodegradation of methylene blue and other organic pollutants which can be used for environmental remediation applications.

*Keywords* – PbS/ZnO, thin film, methylene blue, photocatalytic activity.

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## Biosynthesis, Characterization And Application Of Cuprous Oxide Cu<sub>2</sub>O Nanoparticles

Gagi Abdelkrim, Laib Marawa, Khane Yasmina, Hafsi Zoulikha and Hadjomar Zineb

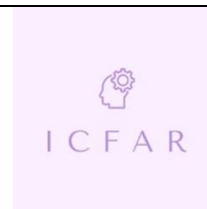
*Université de Ghardaia, BP 455, Ghardaïa, Algeria*

*yasminekhane@yahoo.fr*

**Abstract** – Cu<sub>2</sub>O is a promising semiconductor material with potential applications in various fields such as electronics, energy, and catalysis. This study presents the biosynthesis of Cu<sub>2</sub>O (cuprous oxide) nanoparticles using the *Inula viscosa* plant extract as an eco-friendly and cost-effective alternative methods and evaluated their photocatalytic activity using Congo red as a model organic pollutant. The plant extract of *Inula viscosa* was used as a reducing agent and stabilizer for the green synthesis of Cu<sub>2</sub>O nanoparticles. The Cu<sub>2</sub>O NPs were characterized using UV-visible spectroscopy, Fourier-transform infrared spectroscopy, X-ray diffraction, and transmission electron microscopy. The results confirmed the formation of Cu<sub>2</sub>O nanoparticles with an average size of 50 nm and a cubic crystal structure. The Cu<sub>2</sub>O nanoparticles exhibited significant photocatalytic activity, with a degradation rate of 96% within 60 minutes under UV irradiation. The findings of this study suggest that the the biosynthesis of Cu<sub>2</sub>O nanoparticles using plant extract can be utilized into the development of sustainable and green materials or environmental remediation.

*Keywords* – Cu<sub>2</sub>O, nanoparticle, Biosynthesis, photocatalytic activity.

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## Alginate/polyaniline/graphene Hydrogel Nanocomposite: Preparation, Characterization And Application

Djelloude Souhila, Akif Hadil, Fenniche Fares, Djaber Aouf and Khane Yasmina

*Université de Ghardaia, BP 455, Ghardaïa, Algerie*

*Laboratory of Dynamic Interactions and Reactivity of Systems, University of Kasdi Merbah, 30000 Ouargla – Algeria.*

*yasminekhane@yahoo.fr*

**Abstract** – Alginate/polyaniline/graphene hydrogel nanocomposite is a versatile material that has various applications, including the photodegradation of colorants. The hydrogels based on sodium alginate (SA) as polymer matrix and graphene with PANI as crosslinking agent were synthesized using sol gel method with the aim of incorporating the intrinsic properties of their constituents. The material was characterized using scanning electron microscopy, Fourier-transform infrared spectroscopy, and X-ray diffraction to confirm the stable and highly interconnected networks were obtained from GO nanosheets dispersed in SA matrices which successfully incorporated through interactions with low amounts of PANI. The molecular interactions and morphology were confirmed by Fourier-transform infrared spectroscopy and transmission electron microscopy. for its photocatalytic capacity, and the results showed that it had high for the degradation of colorants. The photocatalytic activity of the hydrogel to degrade of malachite green was evaluated using a UV-Visible spectrophotometer, and the results showed that the material had high efficiently, with a degradation of up to 95%. The use of Alginate/polyaniline/graphene hydrogel nanocomposite for the photodegradation of colorants is a promising solution to protect the environment and public health.

*Keywords –Hydrogel, alginate, grapheme, polyaniline, malachite green, photodegradation.*

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## Development Of a Dressing Based On Alginate/ZnO Bionanocomposite Film For Medical Treatment

Benoudina Imene, Amieur Firouz, Khane Yasmina and Kesbi Brhim

*Université de Ghardaia, BP 455, Ghardaia, Algeria  
University of Kasdi Merbah, 30000 Ouargla – Algeria.*

*yasminekhane@yahoo.fr*

**Abstract** – This study describes the development of a dressing based on Alginate/ZnO film for medical treatment. The dressing was prepared by mixing alginate with different amount of green synthesis Zinc oxide nanoparticles using a sol gel method and forming them into a film. The thin films were characterized using UV-visible spectroscopy, Fourier-transform infrared spectroscopy, X-ray diffraction, and transmission electron microscopy and their medical application was investigated by evaluating its antibacterial activity against human pathogenic bacteria such as gram negative bacteria *Escherichia coli* and gram positive bacteria *Staphylococcus aureus* under visible light irradiation. The results showed that the film had a uniform and compact structure, and good water absorption capacity. The antibacterial activity test proved that the film had significant antibacterial activity and promoted dressing film for medical treatment, particularly in wound healing applications.

*Keywords –Dressing film, alginate, Zinc oxyde, antibacterial activity.*

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*Université de Ghardaia, BP 455, Ghardaïa, Algerie  
University of Kasdi Merbah, 30000 Ouargla – Algeria.*

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*Keywords –Dressing film, alginate, Zinc oxyde, antibacterial activity.*

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## Study Of Thermal And Mechanical Properties Of Poly (lactic acid)- Hydroxyapatite Composites

NedjmaTazibt, Mustapha Kaci, Nadjet Dehouche

Laboratoire des Matériaux Polymères Avancés, Faculté de Technologie, Université de Bejaia 06000, Algeria.

*nedjma.tazibt@univ-bejaia.dz*

**Abstract** – The environmentally benign polymers have been recognized as promising materials for the replacement of polymers derived from fossil oil, thus reducing waste pollution due to their biodegradability ]. Among the family of biodegradable polymers, poly (lactic acid) (PLA) is a bio-based polymer that can be produced from renewable resources. The biocompatibility, bioresorbability and biodegradability of PLA make it suitable for biomedical and food packaging applications. Although PLA offers many good properties, its low toughness and slow crystallization rate limit its use to other industrial applications which need a higher mechanical strength]. To overcome these drawbacks, one of the most common approaches consists of adding either organic or inorganic fillers to PLA including hydroxyapatite (HAp). The effect of hydroxyapatite (HAp) on the morphology and properties of composites based on poly (lactic acid) (PLA) was investigated at various filler content ratios, i.e., 5, 10 and 15 wt%. The film samples were first prepared by solvent casting method followed by melt compounding in an internal mixer and specimens were obtained by thermo-compression. The study showed that the addition of 5 wt% of HAp into PLA led to a slight improvement in both thermal stability and tensile properties of the composite in comparison with neat PLA and other composite samples. Moreover the degradation temperature at 5 wt% loss also increased by almost 5°C compared to that of neat PLA and others. The study highlighted the possibility to use HAp without any prior surface treatment as reinforcement to composites based-PLA intended for medical applications.

*Keywords* – Polylactic acid; hydroxyapatite; biocomposites; morphology; mechanical properties.

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## High Temperature Behavior On The Properties Of Fiber Concrete

Redha Benali , Tarek Mansouri , Rafik Boufarh

*Batna 2 University, LRG-CROI, Department of Civil Engineering, Batna, Algeria*  
*Larbi Tebessi University, LRGCA, Department of Civil Engineering, Tebessa, Algeria*

[r.benali@univ-batna2.dz](mailto:r.benali@univ-batna2.dz)

**Abstract** – Despite the fact that concrete has a good behavior at ambient temperature, this is not true under fire conditions, as it can exhibit thermal instability which may occur in several forms. The introduction of polypropylene fibers into the concrete composition has been proved to be an effective technique to overcome the risk of thermal instability and possible bursting perils.

The objective of the present manuscript is to describe the impact of polypropylene fibers on the behavior of heated concrete subjected to heating and cooling cycles at temperatures of 200, 450 and 600 °C respectively for six hours, through a series of experimental tests on mass loss, porosity, compressive and tensile strength. For this purpose, mixes were prepared with a water/cement ratio with the incorporation of polypropylene fibers with a rate varying from 0.5 to 1.5%. These fibers were added in order to improve the thermal stability and to prevent the concrete from splitting. The results show that a considerable loss of strength was noticed for all tested specimens. The relative compressive strengths of the concretes containing polypropylene fibers were higher than those of the concretes without fibers. Also, a greater loss of mass of the polypropylene fibers compared to those without fibers was noticed when increasing the temperature. The flexural tensile strength of the concrete was more sensitive to elevated temperatures than the compressive strength and a rapid increase in porosity was observed for the fiber-reinforced concrete compared to the reference concrete.

*Keywords* – Concrete; Temperature; Polypropylene Fibers; Mechanical Properties; Physical Properties;.

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## Electrochemical Determination Of Thermodynamic Parameters Of Dysprosium System In Molten LiF-CaF<sub>2</sub>

Abdelkader Saila

*Laboratory of Physico-Chemistry of Materials and Environment  
Department of chemistry, University of Djelfa, Algeria*

*abksaila@yahoo.fr*

**Abstract** – In this work, we are interested in the experimental study of the electrochemical determination of different thermodynamic parameters of dysprosium ions Dy(III); presented in the form of DyF<sub>3</sub> in the molten eutectic LiF-CaF<sub>2</sub>. This research is carried out as a part of a series of studies carried out for the aim of reprocessing nuclear wastes by electrochemical separation methods. Dysprosium is an element of the lanthanides or rare earths, produced during nuclear fission. Lanthanides are neutrophages; they detain neutrons; which reduces the efficiency of the fission reactions.

Our study aims to contribute in the understanding of the behavior of this element to more understanding its extraction process in the form of a metallic deposit on an inert substrate such as Mo or W, or in alloyed form with a reactive substrate such as Ni or Cu [1].

Good extraction results have already been obtained for other rare earths, namely: neodymium, samarium and gadolinium, under the same working conditions. This work was carried out in fluoride medium, well known in nuclear industry for their ability to lead to coherent deposits of electropositive metals such as refractory metals, lanthanides and their alloys [2-6].

In order to determine the thermodynamic parameters of Dy (III) species introduced into the reaction medium in the form of DyF<sub>3</sub>, we performed the electrochemical analyses in the eutectic mixture (LiF-CaF<sub>2</sub>) (79,2-20,8 % molar) in a temperature range of 840 to 1110 ° C.

Study by open circuit chronopotentiometry (at zero current) shows the formation of intermetallic compounds of the Dy-Ni and Dy-Cu systems and to permit the calculation of their free enthalpies of formation (Gibbs free energies) and activities in the different phases.

*Keywords* – Activities, dysprosium, electrochemical separation, molten fluorides, thermodynamic parameters.

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## Smart Energy Management Algorithm For Load Dispatching Based On Renewables Energies Forecasting Of Grid-Connected Micro-Grid

KHEITER Amel, SOUAG Slimane LARBI Arezki

*Department of Electrical Engineering, University of Abdelhamid Ibn Badis Mostaganem, Algeria*

*Department of Electrical Engineering, University of Abdelhamid Ibn Badis Mostaganem, Algeria*

*Department of Electrical Engineering, University of Abdelhamid Ibn Badis Mostaganem, Algeria*

*amel.kheiter.etu@univ-mosta.dz*

**Abstract** – The energy management of a micro-grid can be a complex and challenging task, especially when it comes to ensuring the efficient distribution and use of energy resources. However, with the help of artificial intelligence (AI), it is now possible to optimize the energy management of a micro-grid and achieve significant cost savings. The current research study proposes an energy management system to optimize the economic dispatch problem of a microgrid system which is connected to the power grid and composed of photovoltaic panels (PV), wind turbine, battery energy storage system (BESS). The proposed Energy Management System (EMS) ensures the optimization of micro-grid energy one day in advance based on forecasted energies (photovoltaic, wind, and load). The forecasting module was based on a long short term memory neural network algorithm (LSTM). The predicted energy profiles for the next day were then used as input for the Marine Predators Algorithm (MPA). By using the LSTM algorithm, it was possible to predict photovoltaic, wind, and load energy similar to actual curves with the least mean square error. The designed EMS is capable of ensuring the best energy distribution so that BESS charging and discharging, buying and selling electricity to the national grid will be programmed at the right time while reducing the daily operating cost of the micro-grid.

*Keywords – Energy management system, long short term memory neural network algorithm, battery energy storage system, wind turbine, Marine Predators Algorithm*

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## Optimization Of An Internal Combustion Engine

Mounira Derfoul, Bachir Merzoug, Ahmed Assala, Samira Tlili

*University of Badji Mokhtar, Annaba, Algeria*

*University of Badji Mokhtar, Annaba, Algeria*

*University of Badji Mokhtar, Annaba, Algeria*

*Research Center in Industrial Technologies CRTI, P.O.Box 64, Cheraga 16014 Algiers, Algeria*

*mouniraderfoul25@gmail.com*

**Abstract** – The operation of any real style or process is carried out in the presence of the losses of irreversibilities. This irreversibility result in a mechanical loss of energy. These losses are more significant in the internal combustion engines. Of which the goal to make a general analysis on the losses of energy in order to be able to improve their output. For this reason, we called upon the theory of exergy or availability, which expresses the maximum work, which can be produced starting from the system by the interaction with its environment during a reversible transition to a state of thermal, mechanical, and chemical balance at the conditions of the surroundings. This state of balance is defined like the dead state of the system and depends on the pressure  $P_0$ , the  $T_0$  temperature and the composition of the environment. One starts with a general information on this type of family of the engine, and thermodynamic recall comprising the different statements for irreversibility and availability. After these recalls, a detailed analysis of the process of combustion is reviewed because of its importance in the internal combustion engines.

*Keywords – Thermodynamic cycle, availability, internal combustion engine, reversibility, irreversibility*

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## Experimental And Theoretical Study Of Polyphenols Extracted From Syzygium Aromaticum As Corrosion Inhibitors

Hana Ferkous, Amel Delimi, Kahlouche Abdesalem, amdjed abdenouri, Chérifa Boulechfar<sup>3</sup>, Meriem Gabsi

*Laboratoire de Génie Mécanique et Matériaux", Faculty of Technology, University of Skikda, 21000, Algeria*

*Département of Technology, University of Skikda, 21000, Skikda, Algeria*

*Centre de recherche et technologie industrielle" CRTI Cheraga Algeria*

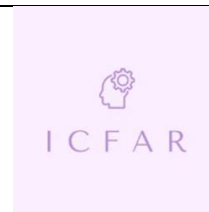
*Laboratoire Matériaux et Systèmes Electroniques", University of Bordj Bou Arreridj, 34000, Algeria*

*a.delimi@univ-skikda.*

**Abstract-** Corrosion causes extensive damage to our equipment and buildings, wasting billions of dollars each. Electrochemical studies were used to fully explore the inhibitory effects of clove pulp (*Syzygium aromaticum*) on the corrosion of mild steel in 1M HCl solution. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) were used to study the surface of mild steel. XPS was used to understand the corrosion inhibition mechanism of mild steel. A potentiodynamic polarization study showed that the inhibitor, through its absorption on the metal surface and inhibition of the active corrosion site, slows down both cathodic and anodic processes. The adsorption of *Syzygium aromaticum* onto the metal was demonstrated by a change in impedance characteristics (charge transfer resistance  $R_t$  and double layer capacitance  $C_{dl}$ ). *Syzygium aromaticum* and the film produced were analyzed using SEM and AFM. The calculated values are in good agreement with the experimental ones. According to the MDS results, the inhibitor *Syzygium aromaticum* adsorbs strongly on the surface of the carbon steel cluster.

*Keywords: MS, corrosion, Syzygium aromaticum, SEM, AFM, XPS, theoretical studies.*

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## Contribution To The Corrosion Inhibition Of Coper in 1 M HCl by Aloe Vera Gel Extract. Experimental And Theoretical Studies

Amel Delimi, Hana Ferkous, Chérifa Boulechfar, Kahlouche Abdesalem, Amdjed Abdenouri, Meriem Gabsi Boussaha Elhadi, Aouici Samia

*Laboratoire de Génie mécanique et Matériaux", Faculty of Technology, University of Skikda, 21000, Algeria*  
*Département of Technology, University of Skikda, 21000, Skikda, Algeria*  
*Centre de recherche et technologie industrielle" CRTI Cheraga Algeria*

*a.delimi@univ-skikda.dz*

**Abstract** -The corrosion inhibition of copper in 1 M hydrochloric acid solution by aqueous extract of Aloe vera gel was studied using linear polarization, electrochemical impedance spectroscopy (EIS) and density functional theory (DFT).The results show excellent performance of the aqueous extract as a corrosion inhibitor for copper .The inhibition efficiency increases with the concentration of the aqueous extract of Aloe vera gel. Electrochemical measurements showed that Aloe vera extract acts as a mixed type inhibitor. The inhibition is due to the adsorption of the extract molecules on the copper surface according to the Langmuir adsorption isotherm. DFT calculations and MD simulations were used to explain the adsorption mode on the metal surface and to determine the adsorption centers of this inhibitor... DFT, MC and MD calculations show a strong adsorption interaction between the extract molecules and the metal surface. Scanning electron microscopy (SEM) coupled with an energy dispersive spectroscopy (EDS) study confirmed that the corrosion inhibition of copper occurs through the adsorption of the extract molecules on the metal surface. The theoretical calculation is in good agreement with the experimental results.

*Keywords : corrosion inhibition, polarization, adsorption, theoretical study, DFT-MD.*

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## **Biodiesel Production From Cotton Seed Oil *Gossypium Arboreum***

OULED BRAHIM Sabrin, HAMEL Marwa Lamise, Khane Yasmina and BABA ARBI Ilias

*Energy and Process Engineering Department / LGPME, Sidi Bel Abbes, Algeria*

*Energy and Process Engineering Department / LGPME, Sidi Bel Abbes, Algeria*

*Department of Process Engineering, University of Ghardaia, Algeria*

*Department of Process Engineering . University of Ghardaia, Algeria*

*sabrinaob99@gmail.com*

**Abstract** – The increase in the earth's population led to a rise in energy consumption, which caused the depletion of fossil energy and an increase in environmental pollution. The world had to search for alternative and renewable energy sources that were less harmful to the environment. Biodiesel fuel was the required solution as the best way to meet energy demand in the future; At the present time, the field of biodiesel fuel has become one of the most important areas of research and interest due to the results achieved, especially with the diversity of its sources and the low cost of its production.

Cottonseed oil is considered one of the most abundant oils, and it is considered one of the inedible oils, which makes it a candidate for use as an alternative to fossil fuels.

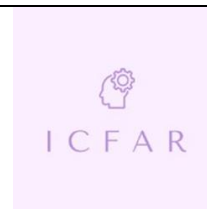
Biofuel production is based on the transesterification of oils. Transesterification uses alcohols in the presence of a catalyst that chemically breaks down the triglyceride molecules into alkyl esters as a biofuel and glycerol as a by-product.

Cottonseed oil *Gossypium arboreum* was extracted using a hexane solvent and a Soxhlet apparatus. Then we calculated the extracted oil yield, which is 38.4%, and studied the oil density, which was estimated at 0.921.

Then the biodiesel was converted from the extracted oil by trans-ester reaction using methanol as it is the cheapest and most abundant and a KOH catalyst and we got a yield of 8.67% of biodiesel. The return was low and this is due to working conditions. In order to study the physical properties of biofuels, we calculated a refractive index of 1.471 and a flash point of 188. The results were in close approach to international standards.

*Keywords – Biofuel , Biodiesel , Cottonseed oil, Gossypium arboreum, Transesterification, physical properties.*

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## Synthesis, Spectroscopic And Theoretical Investigation of A Novel Thiazolidin-4-One Derivative

Mohammed Hadj Mortada Belhachemi, Zohra Douaa Benyahlou, Amine Ould Rabah, Kheira Hammou,  
Nourdine Boukabcha, and Abdelkader Chouaih

*Process engineering department, Abdelhamid Ibn Badis University of Mostaganem, Algeria*  
*Chemistry department, Hassiba Ben Bouali University of Chlef, Algeria*

[mortada\\_blh@yahoo.fr](mailto:mortada_blh@yahoo.fr)

**Abstract** – Thiazolidinone derivatives that incorporate one or two five-membered rings have been widely studied due to their versatile applications in various fields such as biochemistry, medicinal chemistry, photochemistry, industry, and coordination chemistry. We report the synthesis and characterization of a new thiazolidin-4-one derivative, 2-thioxo -3N-(2-ethoxyphenyl -5[4'-methyl -3'N-(2'-ethoxyphenyl) thiazol-2'(3'H)-ylidene] thiazolidin-4-one (E2Th2). The molecular structure of E2Th2 was determined using FTIR and UV-Vis spectroscopic techniques, as well as single crystal X-ray diffraction. In addition, quantum chemical calculations were performed to gain insight into the structural, spectroscopic, and electronic properties of the compound. The calculations were performed using density functional theory (DFT) based on the B3LYP/6-311G (d,p) method, and electronic transitions were calculated according to time-dependent density functional theory (TD-DFT). HOMO and LUMO energy gaps, molecular electrostatic potential (MEP), and global reactivity descriptors were analyzed to gain an understanding of the electronic properties of the compound. The HOMO and LUMO analysis were also used to determine the charge transfer within the molecule. Furthermore, Hirshfeld surface analysis and 2D fingerprint plots were performed to examine the intermolecular interactions contributing to the crystalline structure. The results reveal that H $\cdots$ H (47.6%) and H $\cdots$ S/S $\cdots$ H (19.8%) are the main contributors to the intermolecular interactions, which stabilize the crystalline structure. Overall, this study provides valuable insight into the properties of E2Th2 and may pave the way for the design and synthesis of novel thiazolidin-4-one derivatives with potential applications in various fields.

*Keywords* – Thiazolidin-4-one derivative; Spectroscopic techniques; Quantum chemical calculations; Intermolecular interactions; Electronic properties



## Laser Signal Processing Coded By The Wavelet Transform Its Application In Protection Systems

Brahim Meriane, Salah Rahmouni and Issam Ttifouti

University of Batna 2 (UB2). Algeria, Advanced Electronics Laboratory  
Higher School of Technological Education Skikda ENSET. Laboratory (LPCBM) Algeria

*tlcom\_brahim@yahoo.fr*

**Abstract** – This article introduces the study and realization of the laser barrier alarm system, after the laser is obtained by an electronic card, the wireless control system is connected to the control room to announce the application in real time, and the laser is used in many applications fields, from industry to medicine, in this article on the basis of Industrial applications such as laser barrier.

It uses an alarm system to detect and deter intruders. Basic security includes protecting the perimeter of a military base or a safety distance in unsafe locations or near a government location. The first stage secures surrounding access points such as doors and windows; The second stage consists of internal detection with motion detectors that monitor movements,

In this article, we adopt the embodiment of a coded laser barrier that is transmitted between two units, processes the signal, compares the agreed conditions, and to be high accuracy, we suggest using wavelet transmission to process the received signal and find out the frequencies that achieve alarm activation considering that the transmitted signal They are pulses, but after analysis with a proposed algorithm, we can separate the unwanted frequencies generated by the differential vibrations in order to arrive at a practically efficient system.

*Keywords – Lasers Sources , wavelet transform, Radio frequency ,Laser Coded Barriers, Alarm System*

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## Effect Of Food On Adult Bean Weevil *Bruchus rufimanus* Longevity And Impact Of This Pest On The Host Plant *Vicia faba* L. Seeds Germination

Medjdoub-Bensaad Ferroudja, Lakabi Lynda and Ramdini Ramdane

Laboratoire de production, sauvegarde des espèces menacées et des récoltes. Influence des variations climatiques. Département de Biologie. Faculté des sciences Biologiques et des Sciences Agronomique. Université Mouloud Mammeri de Tizi-Ouzou. 15000. Algérie

**Abstract-** The bean weevil, *Bruchus rufimanus* (Coleoptera: Chrysomelidae) is a monovoltin beetle whose larvae develop at the expense of reserves in the bean *Vicia faba* seeds cotyledons. Adults exhibit reproductive diapause upon training and overwinter in seeds stored or in natural sites such as tree bluffs, soil or lichens. Extended a trophic resource in large quantities presence favor the maintenance, over time, the numbers of insects in a given area. The present work aims to study the effect of food (honey) on the bean weevil *B.rufimanus* longevity during the diapause and the impact of this pest on the germination of bean seeds for *V.faba*. the work was done in the laboratory conditions (temperature and relative humidity maintained at 25°C and 75%). The results show that the longevity of emerging adult unfed ranges from 01 to 210 days. We also noted an irregular mortality between adults males and females. The effect of honey as a food source on the longevity of *B.rufimanus* seems important, our results show that, overall weevils fed live longer then those not fed, and since this insect made the whole cycle of post-embryonic development in the seeds of the host plant *V.faba*, resulting in not only weight loss but also affecting the germination of bean seeds at the expensee vinsect which they developed. Indeed the results also show that the rate of germination and decreases as the number of seed per weevils increases, it passes 100% for healthy seeds to 92% , 68% and 54% respectively in the seeds have enabled the development of 1, 2 and 3 weevils

Keywords : *Vicia faba*, *Bruchus* *rufimanus*, reproductive diapause, seeds, germination

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## Evaluation Of The Effectiveness Of Medicinal Plants Ephedra Alata Alenda Against Neurotoxicity Of Fenthion

Ilhem DJAALALI, Kamilia GUEDRI,

Laboratory of Toxicology and Ecosystems Pathologies, Faculty of Exact Sciences and Nature and Life Sciences, Larbi Tebessi University, Tebessa, Algeria.

*ilhem.djaalali@univ-tebessa.dz*

**Abstract** -From antiquity to today, pesticides are used in agriculture and plant protection against pests. Recently it has been proven that these plant protection products can cause neurotoxic changes in humans. Fenthion is an organophosphate pesticide widely used in agriculture, however, exposure to these molecules can cause neurotoxic manifestations. The aim of this work is to study, on the one hand, the effect of repeated exposure at the rate of 1mg/kg body weight for 30 consecutive days on neuro-behavioral, cerebral oxidative status as well as biochemical parameters, and on the other hand, the ability of a medicinal plant Ephedra alata alenda to alleviate induced alterations. Our results show that exposure to Fenthion causes anxio-depressives and impaired exploratory and locomotor activity associated with inhibition of acetylcholinesterase and triggering of cerebral oxidative stress as shown by decreased glutathione-S-transferase (GST) activity, the increase in malondialdehyde (MDA). In addition, the appearance of oxidative stress was associated with biochemical variations revealed by a disruption of plasma enzyme activity of transaminases (ALAT, ASAT) and metabolic (Cholesterol, Glycemia). These results show the antioxidant, anti-anxiety, antidepressant power of Ephedra alata alenda against the deleterious effects of Fenthion.

*Keywords: Fenthion, Ephedra alata alenda, Behaviour, Toxicity, Rat*

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## Numerical Investigation of Catalytic Combustion of Methane Using Wall Surface Reactions

Abdelkder Mahammedi, Naas Toufik Tayeb, TELHA Mostefa

*Department of Technology, Ziane Achour University of Djelfa, 17000 Djelfa, Algeria*

*Gas Turbine Joint Research Team, University of Djelfa, 17000 Djelfa, Algeria*

**Abstract** - Catalyzed combustion is a low-temperature, flameless process that emits less nitrogen oxide. It also specifies flammability limits and reactor design constraints. Catalyzed combustion's advantages determine its potential applications.

We present a numerical analysis of the catalyzed combustion of a methane-air mixture on a heated platinum channel wall.

The cylindrical channel is modeled with 2D axisymmetric solver. The modeling is based on the "Species transport. The finite volume calculation code Fluent was used to create the various numerical simulations. Interesting findings have been made regarding temperature and the mass fractions of the various species involved in combustion, including methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), water (H<sub>2</sub>O), and nitrogen monoxide (NO) as sources of pollution issues.

*Keywords: catalyzed combustion, methane, platinum, Species transport, finite volume, mass fractions. carbon dioxide*

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## Hydrodynamic Performances Of a Chaotic Micromixer to Enhance Mixing Characteristics

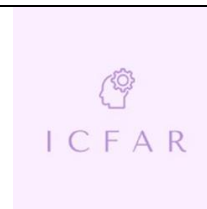
Naas Toufik Tayeb, Abdelkder Mahammed, TELHA Mostefa

*Gas Turbine Joint Research Team, University of Djelfa, 17000 Djelfa, Algeria  
Department of Technology, Ziane Achour University of Djelfa, 17000 Djelfa, Algeria*

**Abstract-**In this study, the effective kinematic performances and homogenization fluid quality for low Reynolds numbers with four different multi-layer micromixers based on the chaotic mixing behavior was carried out. The 3D continuity, momentum, and species transport equations were solved by a Fluent ANSYS CFD code. For various cases of fluid regimes (0.1 to 25 values of Reynolds number), the new configuration displayed a mixing enhancement of 40%–60% relative to that obtained in the older TLCCM in terms of kinematic measurement, which was studied recently. The results revealed that all proposed micromixers have a strong secondary flow, which significantly enhances the fluid kinematic performances at low Reynolds numbers. The kinematic behavior was influenced by the Reynolds number for all proposed micromixers. The new design contributes an enhancement advantage to kinematic measurements, especially for the folding and stretching processes. Strong secondary flows were created inside the new micromixer (TL-CM 3), which enhanced the mixing quality compared to the other geometries.

*Keywords: Micromixer; mixing rate; kinematics; Hydrodynamic characteristics.*

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## Experimental Spectral Characterization, Hirshfeld Surface Analysis, DFT Calculations Studies of (2Z,5Z)-5-(4-nitrobenzylidene)-3-N(2-methoxyphenyl)-2-N'(2-methoxyphenylimino) Thiazolidin-4-one

Kheira HAMMOU, Mohammed Hadj Mortada BELHACHEMI and Zohra Douaa BENYAHLOU and Amine OULD RABAH

*Materials process engineering/ Laboratory of Environmental Science and Technology and Valorisation(STIVA), Abdelhamid ibn Badis University of Mostaganem, Algeria*

*Materials process engineering/ Laboratory of technology and solid Propriis(LTPS), Abdelhamid ibn Badis University of Mostaganem, Algerai*

*kheira84kh@gmail.com*

**Abstract** – In this work we reported an experimental and theoretical spectroscopic studies of (2Z,5Z)-5-(4-nitrobenzylidene)-3-N(2-methoxyphenyl)-2-N'(2-methoxyphenylimino)thiazolidin-4-one molecule, using density functional theory (DFT). Derivatives of the aromatic heterocyclic thiazolidinone are significant, these heterocyclic substances are widely utilized for their biological effects and photovoltaic and optoelectronic applications. FTIR, UV-Vis, single crystal X-ray diffraction, and other spectroscopic methods were used to establish the molecular structure. The molecular inter-contacts were explored using Hirshfeld surfaces (HS) analysis method. Frontier molecular orbitals (FMOs) have been calculated from the optimized structure of the molecule by DFT/B3LYP functional with 6-31G(d, p) basis set. Our theoretical results show a good agreement with the experimental data. The calculated Global reactivity descriptor shows electronic transitions, and to know electronic properties of the compound. To get insight on the charge interaction happening inside the molecule, HOMO and LUMO were scrutinized and their calculated energy gap was found to be 2.96eV, with potential in NLO applications.

*Keywords – DFT, B3LYP, HOMO, LUMO.*



## Gas Separation by Hollow Fiber Membrane

Mezouagh Amina, Khaladi Malika, Mohamed Seghir Zahira and Absar Belkacem

*Department of Process Engineering, University of Mostaganem, Algeria*

*Department of Process Engineering, University of Mostaganem, Algeria*

*Department of Process Engineering, University of Mostaganem, Algeria*

*Department of Process Engineering, University of Mostaganem, Algeria*

[amina-mez1@hotmail.fr](mailto:amina-mez1@hotmail.fr)

**Abstract** – The treatment of natural gas by membrane processes has become an interesting alternative to conventional processes which are very expensive and a source of pollution. A computational method for the prediction of gas separation performance through a gaseous permeator is presented. Two mathematical models are developed to jointly study the effect of the circulation mode of feed and permeate inside the membrane module in the case of an ideal gas and a real gas. The circulation modes explored are co-current and counter-current. The mathematical model developed in the case of counter-current circulation is subject to the problem of boundary values. The proposed method is a combination of the Jacobi (0.2) wavelet method and the iterative decoupling and quasi-linearization technique.

For the validation of the mathematical models developed in this study, we used experimental data from the literature. The results obtained by simulation coincide perfectly with those of the experiment. The next step is to use these models to predict the performance of a membrane module designed to process a natural gas load (case of the LNG1/Z Algeria complex). The results obtained clearly show the efficiency of the counter-current circulation mode compared to the co-current.

*Keywords* – Gas membrane separation, mathematical modelling, co-current flow, counter-current flow.

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## Minimum Cost/Trend Free Fractional Factorial Designs of Resolution IV

Ahlam GUIATNI

*Department of Mathematics /Faculty of Exact Sciences and Computer, University of Jijel, Algeria*

*ahlam.guiatni@univ-jijel.dz*

**Abstract** – Literature lacks systematic  $2^{n-k}$  fractional factorial designs of resolution IV in minimum cost of factor level changes and also resistant to the time trend without limiting the number of factors nor the fractionation number. This article addresses this problem utilizing the Normalized Sylvester-Hadamard  $2^k \times 2^k$  Matrices of order  $2^k$  and their associated saturated orthogonal arrays  $OA(2^k; 2^k - 1; 2; 2)$  in  $n = (2^k - 1)$  factors to construct by factor projection two categories of systematic fractional factorial designs: Minimum cost resolution IV fractional factorial designs ( $(2^{k-2}+1) \leq n \leq 2^{k-1}$ ) and minimum cost linear trend free resolution IV fractional factorial designs ( $2^{k-2} \leq n \leq (2^{k-1} - 2)$ ), where each fractional factorial design  $2^{n-(n-k)}$  is economic in minimum number of factor level changes and allows for the estimation of all main effects unbiased by either the linear time trend or the non-negligible two-factor interactions. The article provides for each proposed fractional factorial design  $2^{n-(n-k)}$ : The  $k$  independent generators to sequence its  $2^{n-(n-k)}$  runs by the Generalized Foldover Scheme to minimize the cost of factor level changes between successive runs and the minimum total cost of factor level changes between the  $2^{n-(n-k)}$  successive runs. Proposed systematic fractional factorial design  $2^{n-(n-k)}$  compete well and sometimes better than existing systematic fractional factorial design  $2^{n-(n-k)}$  of either resolution both in minimizing the experimental cost of factor level changes and in securing factors' resistance to the non-negligible time trend.

*Keywords* – Defining Contrast, Eperimental cost, Factor level, Generalized Foldover Scheme, Hadamar Matrices, Time trend robust run orders

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## Short-term Monitoring And Analysis Of Halophytes Vegetation In Arid Steppe Of South-East Algeria (Biskra)

Amina BELHADJ , Fatma DEMNATI and Nouar BOULGHOBRA

*Department of agricultural sciences, university of Biskra, BP 145 RP, 07000 Biskra, Algeria  
Scientific and technical research centre on the arid regions CRSTRA, Biskra, Algeria*

[amina.belhadj@univ-biskra.dz](mailto:amina.belhadj@univ-biskra.dz)) Email of the corresponding author

**Abstract** – This study consists in conducting a short-term monitoring of vegetation in an arid steppe ecosystem of the region of El-Haouch (Biskra) located in the southeast of Algeria, in order to compare the plant community structure, to diagnose the floristic biodiversity and to analyze some aspects related to the local flora. A site was selected according to a subjective sampling method and phytoecological surveys during the year 2017 and 2018. As a result, it was possible to identify 19 species and 13 botanical families, with a clear dominance of Chenopodiaceae and Asteraceae. According to the biological types, this ecosystem was mainly dominated by chamaephytes and therophytes, indicating the presence of chamaephytization and therophytization phenomena in this area. This phenomenon was also measured by calculating the disturbance index (50% to 80%). According to the Shannon-Winner index, this area was characterized by a relatively low diversity, with a clear dominance of some species. This steppe ecosystem has been relatively degraded under strong climatic influences such as drought and anthropozoic (overgrazing). This study highlights the importance of protection and conservation as an effective management tool for maintaining plant community structure and diversity in threatened ecosystems.

*Keywords – Botanical diversity, Plant communities, Steppe, biological type, disturbance index.*

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## Use of Coagulation-Flocculation Process For The Treatment Of The Treatment Of Real Tannery Wastewater From Fes City (Morocco)

Oumaima Bahammou, Hamza Bellouk, Imane El Mrabet, Karim Tanji, Fouad Khalil, Hicham Zaitan

*Processes, Materials and Environment Laboratory (LPME), Faculty of Sciences and Technology of Fez, BP 2202, Sidi  
Mohamed Ben Abdellah University, Morocco*

*Department of Physics-Chemistry, Polydisciplinary Faculty of Ouarzazate, University of Ibn Zohr, Morocco  
Independent Scientist, Sidi Mohamed Ben Abdellah University, Fez, Morocco*

*Laboratory "Water, Energy and Environment" (LR3E), National Engineering School of Sfax, University of Sfax, Tunisia  
Laboratoire de Chimie Analytique et Moléculaire, Faculté Polydisciplinaire de Safi, Université Cadi Ayyad, Safi, Morocco.*

[hicham.zaitan@usmba.ac.ma](mailto:hicham.zaitan@usmba.ac.ma)

**Abstract** – This study aims to investigate the feasibility to apply a coagulation-flocculation process to treat the tannery wastewater (TWW) of Fez city (Morocco).

Three types of coagulants are assessed: ferric chloride ( $\text{FeCl}_3$ ), and alum ( $\text{Al}_2(\text{SO}_4)_3$ ). Optimum conditions in terms of the removal of chemical oxygen demand (COD), heavy metals, colour and turbidity contents are determined, using a standard jar test apparatus. Optimum coagulant dosages of  $6 \text{ g FeCl}_3 \cdot \text{l}^{-1}$  and  $0.6 \text{ g Al}_2(\text{SO}_4)_3 \cdot \text{l}^{-1}$  are obtained. Ferric chloride allows to remove 46% of COD, 51% of turbidity, 80% of colour with a low sludge volume generation (20%). When the optimum coagulant dose of  $\text{FeCl}_3$  is applied a 59% of COD, 98% of turbidity, 80% of colour are removed with less sludge volume generation (21%). Regarding the analysis of metallic elements, the results show that a substantial elimination of heavy metals is reached, particularly of Cr. These results show that coagulation-flocculation could be used as a promising process for the pretreatment of the tannery wastewater from fez city.

*Keywords: tannery wastewater treatment; Coagulation, Flocculation*

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## The Role Of Zn/Ni Ratio On Dielectric Properties In $\text{Na}_2\text{Zn}_{1-x}\text{Ni}_x\text{P}_2\text{O}_7$ Glass

Cherif MAGHNI, Mohamed KHRROUBI, Chouaieb ZAOUCHE

*Physico-chemistry of Materials and Environment Laboratory, Ziane Achour  
University of Djelfa, BP 3117, Djelfa, Algeria  
Université Mohammed chérif messaadia BP 1553 Souk Ahras 41000, Algérie  
Department of Physics, Faculty of Science, Med Boudiaf University-M'Sila, Bp  
166, 28000 M'sila, Algeria  
Material Sciences Department, Faculty of Science, University of Biskra, 07000  
Biskra, Algeria*

*c.maghni@univ-soukahras.dz*

**Abstract** –The quenching process resulted in a variety of phosphate glasses with nickel  $\text{Na}_2\text{Zn}_{1-x}\text{Ni}_x\text{P}_2\text{O}_7$  content varying from 0 to 5% ( $x = 0, 1, \text{ and } 5\%$  mole). The description of these glasses was based on research on electrical conductivity and infrared spectra. Infrared spectra reveal that phosphorus network depolymerization results in a rise in the Zn/Ni ratio. Electrical proprieties have been researched using dc conductivity as well as impedance spectroscopy. The dc conductivity increases and the activation energy decreases in the glass network when nickel ions are present. Using impedance measurements, it is discovered that the overall conductivity follows Jonscher's power law. For all of the examined glasses, the dielectric constant and loss increased with temperature and decreased with frequency.

*Keywords – Nickel, electrical conductivity, dielectric properties, phosphate glasses, impedance spectroscopy*

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## Oxidative And Inflammatory Stress - Counteracting With Nutritional Antioxidants

Elena Daskalova

Department of Anatomy, Histology and Embryology, Faculty of Medicine, Medical University of Plovdiv, Bulgaria.

**Abstract** Aging is closely linked to the progressive accumulation of cellular and tissue impairments, largely driven by excessive production of reactive oxygen species and an insufficient antioxidant defense. When this imbalance persists, oxidative stress develops and gradually damages biomolecules. In parallel, inflammation — although vital in acute physiological repair — may become persistent and low-grade over time, contributing to the development of age-related disorders including cardiovascular and metabolic pathologies, neurodegeneration, malignant transformation and obesity. The bidirectional connection between oxidative stress and chronic inflammation, increasingly observed with ageing, is described by the term “oxy-inflamm-aging”. This phenomenon is further intensified by immune senescence, genetic background, dysbiosis and intestinal barrier dysfunction, recurring infections, dysfunctional immune responses and other pro-inflammatory triggers. Ageing cells release a wide spectrum of signaling molecules such as cytokines, chemokines, proteolytic enzymes and growth-regulating factors, forming a specific senescence-associated secretory phenotype (SASP) that fuels oxy-inflamm-aging.

Identifying approaches to attenuate these intertwined mechanisms is essential for promoting healthy longevity. One attractive and accessible intervention involves dietary antioxidants of natural origin. Due to its rich profile of polyphenolic compounds, *Aronia melanocarpa* juice exhibits strong antioxidative and anti-inflammatory properties. Our experimental work provides evidence that regular intake of aronia juice supports structural and functional preservation of ageing-sensitive organs such as the thymus, heart, testis, blood vessels and brain. These findings highlight its potential role as a nutritional complementary strategy for successful ageing.

*Keywords: oxy-inflamm-aging, immune senescence, dietary polyphenols, healthy longevity, Aronia melanocarpa*

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## Integrated Management And Prevention Of Aedes Mosquitoes Through Plant Extracts Along With Insecticides

Shabab Nasir

Department of Zoology, Government College University, Faisalabad, Pakistan

[flourenceshabab@yahoo.com](mailto:flourenceshabab@yahoo.com)

**Abstract** - Mosquito borne diseases (malaria, dengue fever, West Nile virus, Zika virus etc) are generally life threatening due to drug resistance in people (malaria) and non availability of vaccines and proper treatment (zika virus, dengue fever, etc). So, the only solution is the management of mosquito population through chemical or biological means. Biological means are slow & environment dependant and chemicals are fast in action but insecticidal resistance has been developed in mosquitoes due to continuous use of pesticides in spite of many other drasting effects on environment. So, current study was carried out to manage the mosquito population under lab conditions with selective chemicals, plant extracts through ether and Bti. For this study, *Aedes aegypti* were collected, identified and reared in cages under lab conditions separately for bioassay. For screening trails, these treatments were applied with three replications and six concentrations of each treatment against 2<sup>nd</sup> and 3<sup>rd</sup> instar larvae separately. Mortality data was collected after 8, 16, 32, 64 and 128 hours respectively. The data was analysed through ANOVA to find out significant factors. Datura leaf, datura fruit, khor tuma, and deltamethrine was screened out as significant factors. After screening experiments, different significant extracts and chemicals were tested in combination to test their efficacy. In the mixing trials, the highest (100%) mortality was observed with those solution having insecticides. The least value of LC<sub>50</sub> (1.3-40 ppm) and LT<sub>50</sub> (0.35-0.83hrs) was observed with solution of ether extracts, and insecticides for larvae.

## Adsorptive Removal of Textile Dyes Using Phosphoric Acid–Activated Biochar Derived From Rice Husk

DJEMMALI Badreddine , DAHDOUH Nadjib , HAFSA Haroun , CHAABANE Toufik , FERNANDES Annabel

**Abstract** - The continuous expansion of textile manufacturing activities has led to the generation of large volumes of wastewater heavily contaminated with synthetic dyes, which are widely recognized for their high stability, resistance to biodegradation, and potential toxic effects on aquatic ecosystems and human health. Conventional treatment methods often fail to achieve complete dye removal, particularly at low concentrations, highlighting the need for efficient and sustainable remediation technologies. In this study, rice husk, an abundant and low-cost agricultural residue, was valorized as a precursor for the production of an efficient biochar adsorbent through chemical activation with phosphoric acid ( $H_3PO_4$ ). The raw biomass was first subjected to controlled pyrolysis, followed by acid activation to enhance its porosity and surface chemistry.

Comprehensive characterization of the prepared biochar was carried out using Brunauer–Emmett–Teller (BET) surface area analysis, Fourier transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). The results revealed the development of a highly porous structure with a large specific surface area and the presence of oxygen-containing functional groups that play a crucial role in dye adsorption. Batch adsorption experiments were systematically conducted to evaluate the effects of operational parameters such as solution pH, initial dye concentration, contact time, and adsorbent dosage on adsorption performance. The adsorption equilibrium data were analyzed using Langmuir and Freundlich isotherm models, with the Freundlich model providing a better fit, suggesting heterogeneous and multilayer adsorption. Kinetic studies indicated that the adsorption process followed a pseudo-second-order model, implying that chemisorption is the dominant mechanism.

Furthermore, the performance of the activated biochar was assessed in simulated textile wastewater containing inorganic salts and auxiliary chemicals commonly present in industrial effluents. High dye removal efficiencies were maintained despite the presence of competing species, demonstrating the robustness of the developed adsorbent. Overall, this study confirms that phosphoric acid–activated rice husk biochar is a cost-effective, environmentally friendly, and sustainable material for the treatment of dye-contaminated textile wastewater. The findings emphasize the significance of agricultural waste valorization within a circular economy framework and support the development of low-cost bio-based adsorbents for large-scale wastewater treatment applications.

**Keywords:** *rice husk, phosphoric acid activation, biochar, textile dyes, adsorption, wastewater treatment.*

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## Growth And Production Of *Capsicum Anuum* Pepper After Inoculation With *Meloidogyne* Spp

Yaici Melha, Ramdini Ramdane et Medjdoub-Bensaad Ferroudja

Laboratoire de production, sauvegarde des espèces menacées et des récoltes. Influence des variations climatiques. Département de Biologie. ,Faculté des sciences Biologiques et des Sciences Agronomique. Université Mouloud Mammeri de Tizi-Ouzou. 15000. Algérie

**Abstract** -Nematodes of *Meloidogyne* genus pose a major threat to chili pepper (*Capsicum annuum*) cultivation. A field experiment was conducted in pots to evaluate the effect of a standardized inoculation of 500 eggs/pot on plant growth and nematode reproduction. Two treatments, uninoculated (control) and inoculated, were compared with 10 replicates each in a completely randomized design. Measured parameters included plant height, dry biomass, gall index, and the number of eggs/pot determined by NaOCl treatment. The results obtained on the test crop showed that 70% of the plants exhibited infestations of varying degrees, ranging from minor damage to complete plant death. Galls were observed on the roots of infested plants, which displayed reduced height and leaf area, as well as a bushy root system bearing galls. The remaining 30% of plants show no infestations; this can be explained by the plant's resistance or by the nematode's behavior.

*Keywords:* Chili pepper, *Capsicum annuum*, nematode, *Meloidogyne*, infestation, Tizi-Ouzou

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## Food as a Modulator of Epigenetic Mechanisms of Aging: Focus on the Role of Polyphenols

Elena Daskalova

*Department of Anatomy, Histology and Embryology, Faculty of Medicine, Medical University of Plovdiv, Bulgaria.*

**Abstract-** Aging is a complex biological process influenced by both genetic and environmental factors, including nutrition. Epigenetic modifications, such as DNA methylation, histone modifications, and non-coding RNA regulation, play a central role in mediating the effects of environmental cues on gene expression and aging. Polyphenols, a diverse group of plant-derived bioactive compounds, have been shown to modulate these epigenetic mechanisms, thereby contributing to the maintenance of cellular homeostasis and the delay of age-related functional decline. Key polyphenols, including quercetin, anthocyanins, and resveratrol, can influence DNA methyltransferases, histone-modifying enzymes, and microRNA expression, leading to favorable changes in gene expression related to inflammation, oxidative stress, and mitochondrial function. Whole dietary patterns rich in polyphenols, such as the Mediterranean diet, demonstrate synergistic effects that may slow epigenetic drift and reduce biological aging, as assessed by DNA methylation markers. This review highlights current evidence on the molecular mechanisms through which polyphenols exert epigenetic effects and emphasizes the importance of dietary context. Future interventional studies integrating epigenetic biomarkers are essential to elucidate the translational potential of polyphenols in promoting healthy aging and longevity.

## **A Five-Slab Classification of Sensitive Information, which the Scientists and the Employees of SPD Organizations Come Across — Handling, Dissemination and Processing**

Syed Arif Kamal

*Visiting Faculty, Department of Aeronautics and Astronautics, Institute of Space Technology; Consultant, GNC (Guidance, Navigation & Control) Laboratories and Ex-Senior Scientific Officer, Control-Systems Laboratories, SUPARCO (Plant), Pakistan Space & Upper Atmosphere Research Commission, Box 8402, PO Karachi 75270, Pakistan*

*Meritorious Professor, Ex-Acting Vice Chancellor, Ex-Dean, Faculties of Science & Engineering and Ex-Chairman, Departments of Applied Physics, Computer Science & Mathematics, University of Karachi, PO Box 8423, Karachi 75270, Pakistan*

[profdrakamal@gmail.com](mailto:profdrakamal@gmail.com)

**Abstract** – A 5-slab classification of sensitive (classified) information is proposed, instead of the customary 3-slab classification in practice these days. Color codes have been assigned to various categories black (key information to be shared with the core team operating the commissioned product), red (could be shared with members of the core R&D group on need-to-know basis), yellow (could be shared within the same SPD organization), green (could be shared with other SPD organizations in the country as well as friendly countries) and white (publishable work in the public domain). The scientists and the employees of SPD (Strategic-Planning Division) organizations in Pakistan need to be trained to properly handle, disseminate and process such information, in particular, product designs and diagrams, product-specific formulae and equations as well as product specifications, during internal discussions, in confidential reports, in press briefings and in publicly-available documents (popular science articles, conference abstracts/proceedings, review articles, research papers, defense-policy papers, security analyses). Communication within the group should be through a cipher code for secure-encrypted communications to prevent leaking of sensitive information through e-mails and smart phones. 30 years after leaving an SPD organization, the author is, still, safeguarding trust of the nation.

*Keywords* – Cipher code for secure-encrypted communications, Defense-policy papers, Product designs and diagrams, Product specific equations, Product-specific formulae, Product specifications, Security analysis

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## Current Issues In The Compliance Procedures "Know Your Customer" (KYC) In Financial Intermediaries

Stanislava Petrova

*Faculty of Economics, Southwestern University "N. Rilski"-Blagoevgrad, Serbia*

**Abstract**-The fight against money laundering from illegal activities is a critical element in maintaining global financial stability and security. Money laundering is the process of concealing the criminal origin of financial funds by giving them the appearance of legally acquired income. This is not only a technical or regulatory problem, but also a direct threat to the economic and social health of countries. "Know Your Customer" (KYC) procedures are a critical element of the compliance framework for combating money laundering (AML) and terrorist financing (CTF) in financial intermediaries. In response to these challenges, innovative solutions are discussed, such as the application of Artificial Intelligence (AI) and Machine Learning (ML) to increase accuracy, as well as the concept of Shared KYC and the potential of Blockchain to provide secure and efficient decentralised identification. The aim of the article is to offer guidance on regulatory adaptation and technological integration necessary to achieve a balance between compliance, security and user experience in the modern financial system. Anti-Money Laundering Science (AML Science) aims to go beyond traditional law enforcement functions by providing empirically based knowledge for effective counteraction to financial crimes. The main objectives of the research are systematized in four directions: 1) Empirical understanding of the process by deconstructing evolving schemes (including in cryptocurrencies and FinTech) and developing reliable methods for estimating the global scale of laundered funds; 2) Impact assessment by calculating the economic effect on GDP and inflation, as well as the social and political influence of corruption and organized crime; 3) Improving the effectiveness of AML frameworks by optimizing regulations (e.g. FATF standards) and integrating innovative tools (AI, ML, Blockchain) to improve KYC procedures and reduce false positives; and 4) Forecasting and preventing future risks associated with technological changes (e.g. DeFi). To achieve these goals, the science uses an interdisciplinary approach, combining: Economic and Financial Models (econometrics, regression analysis for correlation between AML and corruption); Data Analysis and Technological Modeling (Big Data, AI/ML for predictive algorithms and network analysis); Legal and Regulatory Analysis (comparative analysis of legislation and cost/benefit assessment); and Criminological Research (interviews and case studies to understand modus operandi). The intended outcome is to provide practically applicable knowledge for policymakers, with the aim of building a more sustainable and secure global financial system. The comparative analysis demonstrates that major global financial institutions have repeatedly failed to comply with fundamental KYC and AML standards, enabling large-scale money-laundering schemes, sanctions violations, and corruption cases that resulted in billions in financial penalties and severe reputational damage. The evidence shows that KYC deficiencies are rarely isolated operational errors; rather, they reflect deeper organisational weaknesses, regulatory fragmentation, and, in some cases, willful blindness. Against this backdrop, the study highlights the growing importance of technological innovation—AI-enhanced KYC, shared blockchain identity frameworks, and emerging quantum machine-learning models—as essential tools for improving anomaly detection, reducing false positives, and strengthening the overall integrity of the global financial system.



## Transient Heat Transfer Analysis in Fuel Cell Plates Using a Nodal Network Approach

Hüseyin Kahraman\*,<sup>1</sup>

<sup>1</sup>Mechanical Engineering Department/Faculty of Technology, Sakarya University of Applied Sciences, Türkiye

\*huseyink@subu.edu.tr

**Abstract** – Thermal behavior plays a critical role in the performance, durability, and efficiency of fuel cell systems. In practical fuel cell stacks, temperature distribution is often non-uniform due to heat generation from electrochemical reactions, convective heat loss, and material thermal properties. In this study, transient heat transfer in a representative fuel cell plate is numerically investigated using a one-dimensional nodal network approach. The governing energy balance equations are formulated based on conductive heat transfer within the solid domain and convective heat loss at the boundary, and the resulting system of ordinary differential equations is solved using a time-dependent numerical scheme.

The computational model discretizes the plate thickness into uniformly distributed nodes, enabling the prediction of temperature evolution as a function of both space and time. Simulations are performed for different operating durations, with particular focus on short-term (10 s) and long-term (150 s) thermal responses. The results reveal that significant temperature gradients develop during the early transient period, primarily influenced by convective cooling at the exposed surface. As the simulation time increases, thermal diffusion becomes dominant, leading to smoother temperature profiles and a gradual transition toward a quasi-steady-state condition.

The findings highlight the importance of transient thermal analysis in fuel cell components, as temperature gradients may persist over extended operating periods and influence reaction kinetics, water management, and material degradation. The proposed nodal network framework provides a computationally efficient and physically consistent tool for analyzing heat transfer in fuel cell layers and can be extended to multilayer structures and multidimensional models in future studies.

*Keywords* – fuel cell, heat transfer, transient conduction, nodal network method, thermal management

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## Energy Balance Analysis of Layered Structures in Proton Exchange Membrane Fuel Cells

Hüseyin Kahraman<sup>\*,1</sup>

<sup>1</sup>Mechanical Engineering Department/Faculty of Technology, Sakarya University of Applied Sciences, Türkiye

\*huseyink@subu.edu.tr

**Abstract** – Thermal management is a critical aspect of proton exchange membrane fuel cell (PEMFC) operation, directly influencing performance, durability, and operational stability. In multilayer fuel cell stacks, temperature distributions are inherently non-uniform due to differences in material properties, interfacial heat transfer, and convective heat losses at the stack boundaries. Accurate prediction of transient temperature evolution therefore requires a detailed layer-by-layer energy balance analysis.

In this study, a one-dimensional transient heat transfer model is developed to investigate the thermal behavior of layered PEM fuel cell structures. Energy balance equations are formulated for individual fuel cell layers, including end plates, gaskets, flow field plates, and the membrane electrode assembly (MEA). The model accounts for conductive heat transfer within solid layers, convective heat loss to the surrounding environment, and interfacial thermal resistances between adjacent layers. A nodal network approach is employed to discretize the stack in the through-plane direction, resulting in a system of time-dependent ordinary differential equations solved numerically.

Transient simulations are performed for different operating durations (60 s, 240 s, and 480 s) to capture both early-stage and long-term thermal responses. The results demonstrate that significant temperature gradients develop during the initial transient period, particularly near the end plates due to convective cooling. As operating time increases, thermal diffusion becomes dominant, leading to smoother temperature profiles and a gradual transition toward a quasi-steady-state condition. The findings highlight the importance of transient thermal analysis in fuel cell design and emphasize the need for accurate energy balance formulations when evaluating thermal behavior in layered fuel cell stacks.

*Keywords* – fuel cell, heat transfer, transient conduction, nodal network method, thermal management

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## Phytochemical screening and evaluation of antioxidant activity of *Inula viscisa*'s leaves extract

Nadjat AZZI<sup>1\*</sup>, Nour El Houda BELABAS<sup>1</sup>, Younes DOUFFA<sup>1</sup>, Haifaa LAROU<sup>1</sup>, Thoraya GUEMMAZ<sup>1</sup>, Fatima ZERARGUI<sup>1</sup>, Karima SAFFIDINE<sup>1</sup> and Abderrahmane BAGHIANI<sup>1</sup>.

<sup>1</sup>Laboratory of Applied Biochemistry, Department of Biochemistry, Faculty of Nature and Life Sciences, Farhat Abbas University of Setif 1, Setif 19000, Algeria

\*E-mail : [noura196999@gmail.com](mailto:noura196999@gmail.com)

**Abstract** – Plant-derived natural products are abundant in nature and many of them exhibit numerous biological activities, which has a great importance in terms of oxidative stress prevention. The present study aimed to investigate the relationship between phenolic and flavonoids content and the antioxidant activity of the butanol extract (ButE) of *Inula viscosa*'s leaves. Extraction was obtained out by scale liquid-liquid extraction. Total polyphenols and flavonoids content were evaluated using the Folin-Ciocalteu reagent and AlCl<sub>3</sub> methods respectively. The potential of natural antioxidant presents in ButE to inhibit free radicals and reduce metals was evaluated using the stable radical 2, 2'-azino-bis 3-ethylbenzthiazoline-6-sulfonic acid (ABTS) and reducing power. Total polyphenols and flavonoids amounts were  $363.95 \pm 4.56 \mu\text{g GAE/mg}$  and  $13.45 \pm 0.07 \mu\text{g QE/mg}$  of extract, respectively. Butanol extract performed a potent activity in scavenging ABTS<sup>•+</sup> ( $\text{IC}_{50} = 10.81 \pm 0.14 \mu\text{g/ml}$ ), and in reducing power ( $\text{EC}_{50} = 7.62 \pm 0.08 \mu\text{g/ml}$ ). The results indicate that the presence of polyphenols and flavonoids could to some extent account for the antioxidant effect observed in the present study, opening up new prospects for the research and development of innovative plant protection products.

**Keywords** – Medicinal plant, Oxidative stress, Polyphenols, Antioxidant activity, ABTS<sup>•+</sup>, reducing power.



## Thermal degradation study of polyacrylic acid by microcalorimetric measurements

Naziha Bensahla<sup>1\*</sup>, Zoubir Benmaammar<sup>2</sup>

<sup>1</sup> Laboratory of Energy Processes and Nanotechnology (LPEN), Saad Dahlab Blida 1 University, Algeria

<sup>2</sup> Laboratory of Energy Processes and Nanotechnology (LPEN), Saad Dahlab Blida 1 University, Algeria

*\*(nazihabensahla@yahoo.fr) Email of the corresponding author*

**Abstract** – The thermal degradation reaction of Polyacid acrylic was studied by means of microcalorimetric measurements (DSC) under varying percentages of water (10%, 30, 50% and 70%) and in pure form. The degradation was carried out in isothermal mode at two different temperatures (200°C and 250°C).

The analysis of heat flow profiles revealed that polyacrylic acid is sensitive to humidity, resulting in an accelerated degradation process.

The proposed model allowed to determine the kinetic ( $K_{deg}$ ) and energetic ( $\Delta H_{deg}$ ) parameters of polymer degradation. The results obtained showed the acceleration of degradation with the increase in humidity percentage.

The kinetic parameters obtained align well with those reported in existing literature.

*Keywords – Polyacid acrylic, degradation, microcalorimetric measurements, kinetic and energetic parameters*

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## Investigating the Antifungal and Antioxidant Efficacy of Essential Oils and Their Major Compounds

Lamyae Et-tazy<sup>1,2\*</sup>, Abdeslam Lamiri<sup>1</sup>, Laila Satia<sup>2</sup>, Mohamed Essahli<sup>1</sup> and Sanae Krimi Bencheqroun<sup>2</sup>

<sup>1</sup>Department of Applied Chemistry and Environment, Faculty of Sciences and Techniques,  
University Hassan First, BP. 577, Settat 26000, Morocco

<sup>2</sup>Plant Protection Laboratory, Regional Center of Agricultural Research of Settat, National Institute of  
Agricultural Research, Avenue Ennasr, BP. 415 Rabat Principal, Rabat 10090, Morocco;

\*Tazilamia543@gmail.com

**Abstract** – This study investigates the potential of essential oils (EOs) from *Rosmarinus officinalis*, *Myrtus communis*, *Origanum compactum*, and *Eugenia aromatica* for post-harvest preservation. These plants are recognized worldwide for their biological activities. The antioxidant potential of the EOs was evaluated in vitro using DPPH, ABTS, and TAC assays. Their antifungal activity was evaluated against four postharvest pathogens associated with stored chickpeas: *Fusarium culmorum*, *Rhizopus oryzae*, *Penicillium italicum*, and *Aspergillus niger*. The study also evaluated the antifungal activity of key EO compounds: 1,8-cineol, carvacrol, and eugenol. The synergistic effects of combining eugenol and carvacrol were investigated. The EO from *E. aromatica* showed superior antioxidant activity, with the lowest IC<sub>50</sub> values for a DPPH of 0.006 mg/mL. It also showed strong antifungal activity, with MIC values ranging from 0.098 to 0.13 µL/mL. The high concentration of eugenol in this oil contributed significantly to its robust antifungal activity. Eugenol alone showed substantial antifungal efficacy, which was further enhanced when combined with carvacrol at a ratio of 1:3. This combination offers potential for the development of formulations to optimize grain protection during storage. This research highlights the potential of EOs and their key compounds to enhance the preservation of stored agricultural products, paving the way for natural, effective postharvest management strategies.

**Keywords** – Essential oils; Major Compounds; Natural alternatives; Antioxidant activity; Antifungal activity.

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## Computer-assisted optimization process for environmental dye treatment in wastewater

Amel BELAYACHI-HADDAD<sup>\*1</sup>, Noureddine BENDERDOUCHE<sup>1</sup>, Benaouda BESTANI<sup>2</sup> and Cherif  
HADDAD<sup>3</sup>

<sup>1</sup>SEA2M Lab, University of Mostaganem, Algeria

<sup>2</sup>CHERIF HADDAD Consulting and Expertise, Algeria

<sup>\*</sup>([amel.belayachi@univ-mosta.dz](mailto:amel.belayachi@univ-mosta.dz))

**Abstract** – This study explores the application of computer-assisted optimization in the factorial design of wastewater treatment processes for the removal of Nylosan Red, a prevalent synthetic dye. By integrating computational tools with factorial design, the research aims to enhance the efficiency and precision of optimizing treatment parameters. Key variables such as pH, temperature, dosage, and time were systematically evaluated using a full factorial design. Advanced software facilitated the analysis of these factors and their interactions, enabling the identification of optimal conditions for maximum dye removal. The computational approach not only streamlined the experimental process but also provided deeper insights into complex interactions among variables. The optimized conditions achieved through this method resulted in a dye removal efficiency exceeding 98%. This study demonstrates the significant advantages of combining computer-assisted techniques with factorial design, offering a powerful approach for developing effective and sustainable wastewater treatment strategies for synthetic dyes.

**Keywords** – Azo Dye, Computer-assisted methods, Wastewater, Factorial design, Optimization

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## Exploration of Natural Fiber Processing Techniques for Bio-based Building Materials Applications: A Review

Adel Baghdad Zougar \*<sup>1</sup>, Ahmed Soufiane Benosman<sup>1,2</sup>, Farid Brahim Houti<sup>1,3</sup>, Abdelmadjid Lasledj<sup>1</sup>, Imane Fatima Zohra Mesli<sup>3</sup>, Abdelhak Badache<sup>1,4</sup>

<sup>1</sup> Département de Génie Civil, Laboratoire LABMAT, ENPO Maurice Audin, Algérie

<sup>2</sup> Ecole Supérieure en Sciences Appliqués, ESSAT, Tlemcen, Algérie

<sup>3</sup> Département de Génie Civil, Laboratoire EOLE, Université Abou Bekr Belkaid, Algérie

<sup>4</sup> Département de Génie Civil, Université Ahmed Zabana de Rélizane, Rélizane, Algérie

[\\*baghdadzougaradel31@gmail.com](mailto:*baghdadzougaradel31@gmail.com)

**Abstract** – This literature review looks at the different processing techniques for natural fibers in the manufacturing of biosourced construction materials, focusing particularly on examples such as Diss fiber. It begins with a meticulous cleaning step aimed at removing impurities, which improves the adhesion of the fibers to the composite materials. Then, chemical treatments are often applied to strengthen the compatibility of the fibers with the polymeric or mineral matrices, resulting in an improvement in the mechanical properties of the finished products.

Fiber extraction and separation play a crucial role in ensuring consistent quality, suitable for a variety of construction applications. Heat treatment, such as carbonization, is also used to increase the dimensional stability of fibers and their resistance to biological degradation.

By combining these different processing approaches, it is possible to produce treated natural fibers with high mechanical performance while reducing their environmental impact. This field of research thus opens the way to new innovations in the field of ecological and sustainable construction solutions, providing answers to contemporary challenges in terms of sustainability and the environmental footprint of the construction industry.

*Keywords - Diss fiber, Fiber processing, Mechanical properties, Biosourced, Durability, Adhesion, Impurities.*

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## Data Analysis of Moroccan Secondary School From 2004 to 2021: Case Tangier Tetoun Al Houceima Region

Bayad Fouzia<sup>\*</sup>, Azyat Abdelilah<sup>2</sup>, Ben Achhab Nizar<sup>3</sup> and Raissouni Naoufal<sup>4</sup>

<sup>1</sup>Remote Sensing & GIS Unit, ENSA, Tetuan, Morocco

<sup>2</sup>MIA Research Unit, ENSA Tangier, Morocco

<sup>3</sup>Remote Sensing & GIS Unit, ENSA, Tetuan, Morocco

<sup>4</sup>Remote Sensing & GIS Unit, ENSA, Tetuan, Morocco

*\*(fouziabayad1@gmail.com)*

**Abstract** – Data analysis processes allow recognizing issues, patterns, trends, causes, parameters, and possible results for the reason to realize the monitoring, evaluation and assessment functions. In this work, we have outlined the fundamental use of Data Analytics to improve Decision-Making (DM) in Moroccan Education System. We have made a data analysis for education in Morocco throughout 18 years from 2004 to 2021. First of all, we generally have collected education data from the HCP (High Commission for Planning) about the students' enrollment in the secondary schools of Tangier-Tetouan-Al Hoceima Region of Morocco from 2004 till 2021. Furthermore, for the eight different province of the Tangier-Tetouan-Al Hoceima Region, we have gathered data for secondary school enrollments. Secondly, we have maintained to Data Cleaning Process (DCP). Thirdly, we have stored our data. And Finally, we have visualized this data with charts to analyze them. The results showed that the secondary schools' student enrollment had a steady increase from 2004 to 2021 in the perspective provinces. The study showed that the province Tanger-Assilah has the highest enrollment rate while Fahs-Anjra has the lowest enrollment rate. According the results, the secondary schools students' enrollment has increased from 77295 to 169599 in the Tangier-Tetouan-Al Hoceima Region of Morocco from 2004 till 2021.

*Keywords* – Secondary Schools, School Enrollment, Tangier-Tetouan-Al Hoceima Region, Data Cleansing, Data Visualization

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## Artificial Intelligence and the New Culture Industry: A Frankfurt School Critical Analysis

Burçe Akcan\* and Merve Gençyürek-Erdoğan<sup>2</sup>

<sup>1</sup>Advertising, Selçuk University, Turkey

<sup>2</sup>Radio, Cinema and Television, Ankara Hacı Bayram Veli University, Turkey

\*(burce@selcuk.edu.tr) Email of the corresponding author

**Abstract** – This paper critically examines the cultural, ideological, and socio-economic implications of artificial intelligence (AI) through the theoretical framework of the Frankfurt School. Building on Adorno, Horkheimer, and Marcuse, the study argues that AI represents a new stage of the culture industry—one in which automation, algorithmic governance, and data-driven personalization intensify processes of standardization and pseudo-individualization. Generative AI systems are shown to accelerate the commodification of culture by transforming creative production into a statistically patterned, automated process. Meanwhile, algorithmic decision-making institutionalizes instrumental rationality, shifting societal notions of reason toward efficiency, prediction, and control while obscuring underlying power relations.

The paper further analyzes how AI reshapes creative labor, deepens alienation, and contributes to a one-dimensional social reality in which user experiences and preferences are pre-structured by opaque technological systems. Personalization mechanisms, often framed as tools of empowerment, function instead as subtle forms of domination that limit autonomy and erode critical consciousness.

Drawing on negative dialectics, the study highlights potential avenues for resistance, including transparency in algorithmic infrastructures, democratic oversight, and alternative technological practices that challenge the homogenizing logic of digital capitalism. Overall, the paper contends that understanding AI through the Frankfurt School remains essential for evaluating its broader societal impact and envisioning more emancipatory technological futures.

*Keywords* – Artificial Intelligence; Culture Industry; Instrumental Rationality; Alienation; Frankfurt School

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## Financial Resilience of the Insurance Sector in the Post-Pandemic Era: A Fundamental Analysis Approach

İbrahim Karaaslan<sup>\*</sup>, Ayşegül Karadavut<sup>2</sup>

<sup>1</sup> Department of Aviation Management / School of Applied Sciences, Gümüşhane University, Türkiye

<sup>2</sup> Department of Business Administration / Graduate School of Education, Gümüşhane University, Türkiye

<sup>\*</sup>([ibrahimkaraaslan@gumushane.edu.tr](mailto:ibrahimkaraaslan@gumushane.edu.tr))

**Abstract** – Insurance companies are fundamental financial intermediaries that support the stability of the economic system and help manage the financial risks individuals and institutions may face. Due to its role in converting savings into long-term capital, reducing economic uncertainty through risk transfer, and deepening financial markets, the insurance sector plays a strategic role for both macroeconomic growth and financial sustainability. In this context, analyzing insurance companies' financial structures is essential for assessing the sector's resilience and future performance potential. This study aims to examine the financial performance of insurance companies in 2024 and 2025 using fundamental analysis ratios. The analysis is based on sector-specific financial indicators, including profitability ratios (technical profitability, return on equity), liquidity ratios, capital adequacy indicators, and the loss/premium ratio. The findings show that increasing cost pressures and the inflationary environment in 2024 had a limiting effect on technical profitability, while companies with strong capital structures managed this process more smoothly. In 2025, increased premium production and improvements in risk management practices led to a relative recovery, particularly in profitability and capital adequacy ratios. Overall, fundamental analysis ratios indicate that the insurance sector largely maintained its financial resilience during this period, but that effective cost management and strengthening the capital structure are critical for sustainable performance.

*Keywords* – Insurance Company, Fundamental Analysis, Post-Pandemic,

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## A Bibliometric Analysis of Research Trends on the Impact of Corporate ESG Scores on Financial Performance

İbrahim Karaaslan<sup>\*</sup>, Ayşegül Karadavut<sup>2</sup>

<sup>1</sup> Department of Aviation Management / School of Applied Sciences, Gümüşhane University, Türkiye

<sup>2</sup> Department of Business Administration / Graduate School of Education, Gümüşhane University, Türkiye

*\*(ibrahimkaraaslan@gumushane.edu.tr)*

**Abstract** – This study aims to examine the development, structure, and research trends of the academic literature addressing the relationship between corporate environmental, social, and governance (ESG) performance and financial performance through a bibliometric analysis approach. Within this scope, a total of 3,808 scientific publications published between 2010 and 2025 and indexed in the Web of Science (WoS) Core Collection database were analyzed. The bibliometric analysis maps annual publication trends, author- and country-based contributions, citation and co-citation structures, inter-institutional interactions, and keyword co-occurrence networks using the VOSviewer software. The findings indicate that the ESG–financial performance literature has expanded rapidly, particularly after 2018, and has evolved into a multi-centered academic structure. Co-authorship and citation analyses reveal that scholarly collaboration is concentrated around specific clusters, with authors such as Khaldoun Albitar, Khaled Hussainey, John W. Goodell, Maria Giuseppina Bruna, and Stefano Pisera standing out due to both their publication output and strong positions within collaboration networks. Keyword co-occurrence analysis shows that terms such as “ESG,” “ESG performance,” “financial performance,” “sustainability,” “corporate governance,” and “corporate social responsibility” occupy central positions in the literature, indicating a predominant focus on sustainability, firm value, and governance-related themes. Institution- and country-level findings further demonstrate that the United States, China, and the United Kingdom hold central positions in the literature, while institutions such as Capital University of Economics and Business, Xi’an Jiaotong University, Université de Sfax, and the Centre for Economic Policy Research (CEPR) emerge as leading academic hubs with high citation and link strength.

*Keywords* – ESG, Financial Performance, Bibliometric Analysis, Sustainability, Corporate Governance

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## Multi-Layer Diabetic Footwear with Patient-Specific Off-Loading: A Cost-Effective Solution for Ulcer Management and Prevention

Levent Aydin

*Podiatry Department, Kocaeli University, Turkey*

*levent.aydin@kocaeli.edu.tr*

**Abstract** – Diabetic Foot Ulcers (DFUs) represent a significant global health burden, with off-loading being the cornerstone of treatment to reduce plantar pressure and promote healing. This study introduces a novel, patient-specific, wearable footwear system (slipper and sandal models) designed to support DFU healing across all stages. The core innovation lies in a multi-component structure featuring a main body with an integrated, customizable EVA foam insole. This insole is uniquely designed based on gait analysis data, allowing for the precise creation of patient-specific off-loading cavities within the foam layers to completely relieve pressure from the ulcer site. The system incorporates adjustable hook-and-loop (Velcro) straps, secured with a thin leather lining to prevent skin irritation, ensuring a secure and customizable fit. The entire assembly is anchored to a durable, non-slip rubber outsole, making the device suitable for both indoor and outdoor use, which is critical for patient adherence and continuous off-loading. The footwear components, including the main body and the off-loading EVA foam (30 Shore A density), are manufactured using a CAD/CAM system, ensuring high precision and reproducibility. Preliminary analysis suggests that while the initial production involves custom materials and labor, the system offers a cost-effective alternative to comparable off-the-shelf or non-removable off-loading devices by significantly reducing the risk of recurrence and associated long-term healthcare costs. The successful application of off-loading principles, by redistributing body weight away from the wound area, provides a scientifically sound basis for enhanced wound healing velocity. This design offers a practical, comfortable, and scientifically grounded solution for DFU management.

*Keywords* – Diabetic Foot Ulcer, Off-Loading, EVA Foam, Gait Analysis, Custom Footwear, Wound Healing

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