SCHOLARLY PUBLICATIONS
School of Applied Sciences
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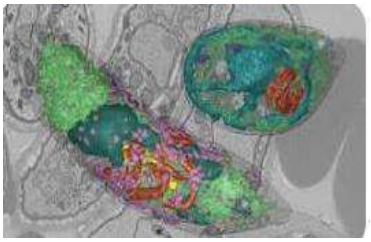
Journal Name: Nature Communications **IF: 14.7**

Title: Evidence of isospin-symmetry violation in high-energy collisions of atomic nuclei

Author: Zwaska R.; Zviagina A.; Zimmerman E.D.; Zherebtsova E.; Zaitsev A.; WyszyÅ„ski O.; WÃ³jcik K.; Witek K.; Wickremasinghe A.; Volkov V.; Vitiuk O.; Vechernin V.V.; VeberiÄ D.; Valiev F.F.; Urbaniak M.; Unger M.; Tveter I.C.; Andronov E.V.; Amin N.; Allison K.K.; Adrich P.; Adhikary H.; Giacosa F.; Gorenstein M.; Poberezhniuk R.; Samanta S.

Details: Volume 16, Issue 1, December 2025

Abstract: Strong interactions preserve an approximate isospin symmetry between up (u) and down (d) quarks, part of the more general flavor symmetry. In the case of K meson production, if this isospin symmetry were exact, it would result in equal numbers of charged (K^+ and K^-) and neutral (K^0 and K^-0) mesons produced in collisions of isospin-symmetric atomic nuclei. Here, we report results on the relative abundance of charged over neutral K meson production in argon and scandium nuclei collisions at a center-of-mass energy of 11.9 GeV per nucleon pair. We find that the production of K^+ and K^- mesons at mid-rapidity is (18.4 ± 6.1)% higher than that of the neutral K mesons. Although with large uncertainties, earlier data on nucleus-nucleus collisions in the collision center-of-mass energy range 2.6<sNN<200 GeV are consistent with the present result. Using well-established models for hadron production, we demonstrate that known isospin-symmetry breaking effects and the initial nuclei containing more neutrons than protons lead only to a small (few percent) deviation of the charged-to-neutral kaon ratio from unity at high energies. Thus, they cannot explain the measurements. The significance of the flavor-symmetry violation beyond the known effects is 4.7σ when the compilation of world data with uncertainties quoted by the experiments is used. New systematic, high-precision measurements and theoretical efforts are needed to establish the origin of the observed large isospin-symmetry breaking.



URL: https://www.nature.com/articles/s41467-025-57234-6

SCHOLARLY PUBLICATIONS
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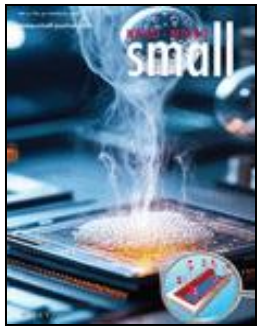
Journal Name: Small **IF: 12.1**

Title: Nucleobase Regulated Facet Engineering Enables Zinc(100) Oriented Growth for Long-Life Zinc Anode under Combined Elevated Areal Capacity and Current Density

Author: Sarkar, S.K.; Maharana, A.K.; Sarkar, R.; Rambabu, G.; Dash, B.; Pradhan, M.; Pradhan, G.K.; Jhaa, G.; Thakuria, S.; Paul, S.; Das, S.

Details: 8 October 2025

Abstract: The extremely short cycling life of Zn-anode under combined high areal capacity and current density remains a key barrier to the large-scale AZIB deployment. Herein, it is experimentally and theoretically demonstrated that adenine, a multirole zincophilic biomolecular electrolyte additive, outperforms other nucleobases, promoting Zn deposition toward (100) plane, notably enhancing cycling stability under simultaneous ultrahigh areal capacity and current density. Owing to its multiple nitrogen atoms with varying basicity, adenine engages in multifaceted interactions, including coordination with solvated Zn^{2+} ions, adsorption on the Zn(002) plane, and H-bonding with both solvated and bulk water molecules. These synergistic interactions passivate the thermodynamically stable Zn(002) plane, suppress interfacial water-induced HER and byproduct formation, and promote dendrite-free Zn deposition along the high-energy (100) plane. The resulting crystallographic regulation results in long-cycle-life Zn stripping/plating even under practically demanding harsh conditions of ultrahigh areal capacity and current density. In an adenine-boosted Zn||Zn symmetric cell achieves a cycle-life of 1060 h under combined conditions of 40 mA cm^{-2} and 40 mAh cm^{-2} and a record cumulative capacity of 42400 mAh cm^{-2}. Current findings highlight the potential of zincophilic biomolecular additive design principles in overcoming key interfacial challenges, enabling a distinctive, environmentally benign pathway toward realizing large-scale AZIB development.



URL: https://onlinelibrary.wiley.com/doi/abs/10.1002/smll.202508779

SCHOLARLY PUBLICATIONS
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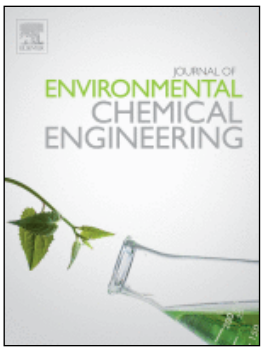
Journal Name: Journal of Environmental Chemical Engineering **IF: 7.2**

Title: A comprehensive review on biogenic synthesis and environmental - applications of precious metal nanoparticles

Author: Kar, P; Muduli, S; Nayak, S; Nayak, RK; Parhi, PK

Details: Volume 13, Issue 6, December 2025

Abstract: Water pollution from inorganic and organic contaminants poses a severe environmental and health risk, necessitating the development of sustainable remediation technologies. In recent years, precious metal-based nanoparticles (NPs) have emerged as highly effective materials for pollutant removal from aqueous environments due to their unique physicochemical properties. This review presents a comprehensive overview of the synthesis strategies for precious metal NPs, including physical; laser ablation, ball milling), biological; plant extracts, bacteria, fungi, and chemical; reduction, sol–gel, co-precipitation methods. Unlike previous reviews, this work introduces a comparative framework that systematically links synthesis parameters to na noparticle characteristics and environmental performance. The environmental applications of these NPs—such as adsorption, photocatalytic degradation, catalytic reduction, and antibacterial activity—are critically discussed, with practical examples. For instance, biologically synthesized silver NPs exhibit excellent antibacterial properties and high dye adsorption capacity (up to 161.3 mg/g for Congo red), while gold NPs effectively catalyze the reduction of 4-nitrophenol in pharmaceutical wastewater. The optimization of synthesis conditions and their direct influence on nanoparticle stability, reactivity, and selectivity are thoroughly examined. A variety of advanced characterization techniques used to assess the structural, morphological, and functional attributes of the NPs are also discussed. The influence of synthesis conditions on NP stability, reactivity, and selectivity is examined alongside commonly employed characterization techniques. This review highlights the potential of precious metal NPs as next-generation materials for water treatment, offering insights into their optimization for real-world environmental applications. It also outlines current challenges and future prospects for integrating these nano-materials into scalable and eco-friendly remediation systems.



URL: https://www.sciencedirect.com/science/article/abs/pii/S2213343725038606

SCHOLARLY PUBLICATIONS
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Journal Name: Environmental DNA **IF: 6.2**

Title: Harnessing Environmental DNA to Explore Frugivorous Interactions: A Case Study in Papaya (Carica papaya) and Pineapple (Ananas comosus)

Author: Banerjee, P.; Maity, J.P.; Chatterjee, N.; Weber, S.; Dey, G.; Sharma, R.K.; Chen, C.-Y.

Details: Volume 7, Issue 5, 10 October 2025

Abstract: Plant–animal interactions (PAIs) are critical in natural and agricultural ecosystems, mediating energy flow with both positive and negative interactions. Traditional methods of tracking PAIs, such as morphological identification and camera trapping, are limited in speed and scalability, posing challenges for comprehensive biodiversity monitoring. Recently, environmental DNA (eDNA) metabarcoding has emerged as a promising technique for detecting species interactions non-destructively. This pilot study explores the application of eDNA metabarcoding to investigate frugivorous interactions involving 18 partially consumed and three intact fruits of each *C arica papaya* and *Ananas comosus*. Metabarcoding of mitochondrial COI gene fragments generated 796,234 paired-end reads representing 117 ASVs spanning diverse taxonomic groups, including Metazoans, Protozoans, Algae, Fungi, and Bacteria. After filtering for animal taxa, 41 ASVs were retained, dominated by Arthropoda (~97%). Major frugivores included *Drosophila*, *Zaprionus*, and *Bactrocera* species. Additional detections included beetles, ants, parasitoid wasps, and vertebrates such as *Acridotheres javanicus*, *Callosciurus erythraeus*, and *Bandicota indica*. Moreover, consumed fruits showed high insect (~90%–95%) and mammal (~4%–5%) DNA, while intact fruits were dominated by rotifers (~75%–80%). Distinct communities were found between pineapple and papaya, with 15 and 11 unique ASVs, respectively, and only one ASV was unique to intact fruits. Alpha and beta diversity analyses confirmed the differences in community structure between fruit types. Despite the limited sample size, our findings demonstrate the potential of fruit-surface eDNA to monitor frugivory and species interactions. Future studies should scale this approach across seasons and crop types to assess its potential in long-term biodiversity and pest management monitoring.

URL: https://onlinelibrary.wiley.com/doi/10.1002/edn3.70196

SCHOLARLY PUBLICATIONS
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Journal Name: Surface and Coatings Technology **IF: 6.1**

Title: Unveiling the synergy of MXene supported ZIF-8 hybrid catalyst for enhanced oxygen evolution reaction

Author: Azmi Z.; Deepak D.; Kadadevar A.; Chowdhury A.; Nair M.G.; Roy S.S.; Das A.; Mohapatra S.R.

Details: Volume 512, September 2025

Abstract: The oxygen evolution reaction (OER) is a critical process in sustainable energy technologies, but its sluggish kinetics necessitate efficient, non-precious metal catalysts. ZIF-8 has recently gained attention as a model electrocatalyst due to its porous structure, functional channels, and high Brunauer-Emett-Teller (BET) surface area. However, its poor conductivity and aggregation hinder its OER performance. MXene, a family of multifunctional 2D material with rich surface chemistry, shows great promise as a catalyst support material. This study presents the synthesis of ZIF-8 and MXene composites (MXene@ZIF-8) with varying ZIF-8 concentrations while maintaining a constant MXene mass to evaluate the supportive function of MXene in improving the OER performance of the composite. The optimized MXene@ZIF-8 (1:5) catalyst achieved superior performance, with a reduced overpotential (330 mV) and Tafel slope (149.79 mV/dec) compared to ZIF-8 (579 mV, 351.38 mV/dec) and MXene (613 mV, 400.02 mV/dec). It also exhibited exceptional durability, maintaining stability at 10 mA/cm^2 for 50 h in alkaline condition. The enhanced performance stems from its increased BET and electrochemically active surface areas. The incorporation of MXene introduces mesopores, increases pore volume, enhances hydrophilicity, and reduces charge transfer resistance, collectively facilitating efficient electrolyte diffusion and reactant accessibility. This study underscores MXene's potential as an efficient and cost-effective support material for advancing OER catalysts, facilitating the development of advanced sustainable energy solutions.

URL: https://www.sciencedirect.com/science/article/pii/S0257897225006759?via%3Dihub

SCHOLARLY PUBLICATIONS
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Journal Name: Biomass and Bioenergy **IF: 5.8**

Title: Sustainable biochar production from shrimp pond algal waste: Optimization of pyrolysis parameters using the L9 Taguchi method

Author: S.P., Palai, Shusree Prachi; S., Senapati, Soumyaranjan; S., Muduli, Sthitiprajna; A.K., Panda, Alok Kumar; T.K., Bastia, Tapan Kumar; P.K., Parhi, Pankaj Kumar

Details: Volume 204, Jan 2026

Abstract: Algal blooms *(Spirogyra)*, a common environmental challenge in shrimp farming, offer a valuable opportunity for sustainable waste conversion into biochar. This study evaluates the feasibility of producing biochar from algal biomass through pyrolysis, focusing on optimizing three key process parameters: temperature, residence time, and heating rate. An L9 Taguchi orthogonal array was used to design the experiments. Biochar yield and quality were analyzed using advanced characterization techniques, including PXRD, FESEM, EDAX, CHNS, RAMAN, FTIR, BET, XPS, analysis, particle density, and pH measurement, to understand the physicochemical properties of the resulting biochar. From the characterization data, the optimization of biochar yield in the context of the functional group's perspective and surface area is 70.5 % and 66.1 %, respectively. The pyrolyzed product, pristine biochar, demonstrated that processing conditions significantly influence biochar structure and properties quantitatively and qualitatively. These findings provide insight into optimal pyrolysis parameters for enhancing biochar quality, with potential applications in environmental remediation and agricultural sustainability.

URL: https://www.sciencedirect.com/science/article/pii/S0961953425008128?via%3Dihub

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Journal Name: Materials Research Bulletin **IF: 5.3**

Title: In situ Raman and electric modulus study of NBT-ST-KNN ceramics: An insight into temperature evolution of relaxor dynamics

Author: Singha A.; Praharaj S.; Rout D.

Details: Volume 190, October 2025, 113534

Abstract: Polar nanoregions (PNRs) are often argued to be the key factor in enhancing the functional properties of relaxor-based ferroelectrics. The creation and relaxation of these polar entities are believed to be strongly temperature-dependent, but the explanation is still unclear. In this investigation we have chosen a well-established relaxor system $(0.8\text{-}x)(Na_{0.5}Bi_{0.5})TiO_3\text{-}0.2SrTiO_3\text{-}x(K_{0.5}Na_{0.5})NbO_3$; (x = 0.005, 0.01, 0.04 and 0.1) to probe into the thermal dynamics of PNRs using in-situ Raman and electric modulus formalism. The Raman spectra segregate into different temperature zones corresponding to ferroelectric-relaxor transition ($T_{F\text{-}R}$), maximum dielectric constant (T_m) and Burn's temperature (T_B). A closer introspection of width and position of peak peaks around these temperatures depicts the existence of local structural heterogeneities. Further, the frequency-dependent electric modulus, M"(f) study demarcates high-frequency shoulder (related to PNR relaxation) from intermediate frequency peak corresponding to bulk response. Analysis of Z"(f) and M"(f) predict temperature evolution of long-range ordered regions to localized relaxations.

URL: https://www.sciencedirect.com/science/article/pii/S0025540825002429?via%3Dihub

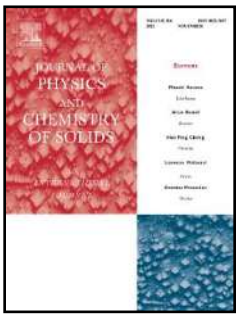
Journal Name: Journal of Physics and Chemistry of Solids **IF: 4.9**

Title: Unveiling the metal-insulator-transition in NaIrO3: The role of spin-orbit coupling and strong electron correlation using ab initio method

Author: Behera, SS; Parida, P

Details: Volume 208, Jan 2026

Abstract: Motivated by the unsuccessful attempts using the density functional theory (DFT) alone to study the insulating behavior of NaIrO post-perovskite compound, employing the interplay between the spin–orbit coupling (SOC) and strong electron correlation (U) effect, we have studied the structural, elastic, and electronic properties of this compound. Here, we have compared the effects of weak Jahn-Teller distortion, strong electron correlation at the transition metal and ligand sites, as well as the spin–orbit effect of the Ir atom to explore the insulating behavior of NaIrO. This post-perovskite compound is associated with the tilting of octahedra in alternate layers, and the ab initio parameters are obtained to carry out this work. We employ the GGA+PBE approximation with full relativistic pseudopotentials to perform calculations including U and spin–orbit interactions within the Quantum Espresso package. From the elastic properties we have investigated that this compound is mechanically stable and ductile in nature. The compound also show anisotropic behavior at different plane.



URL: https://www.sciencedirect.com/science/article/pii/S0022369725004615?via%3Dihub

SCHOLARLY PUBLICATIONS
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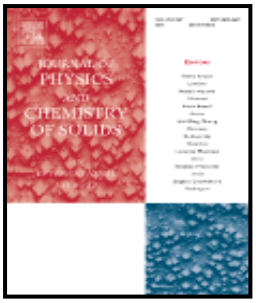
Journal Name: Journal of Physics and Chemistry of Solids **IF: 4.9**

Title: Enhanced magnetic properties and room temperature magnetodielectric response in (1-x) Bi2Fe4O9 - (x) La067Sr033MnO3 (x=0.1-0.3) composites

Author: Pati, A; Mohapatra, SR; Kaushik, SD; Dhara, S; Sahu, DP; Singh, AK; Nanda, J; Tripathy, SN

Details: Volume 208, Issue 2, January 2026

Abstract: We report an enhanced magnetic and magnetodielectric (MD) coupling in antiferromagnetic (AFM) spin frustrated Bi2Fe4O9 (BFO) turned composite with substantial variation of La067Sr033MnO3 (LSMO). Phase formation is confirmed from room temperature Rietveld refinement of X-ray diffraction data. The composite shows orthorhombic crystal structure with space-group 'Pbam + Pbnm' which is also well supported from Raman spectra. XPS analysis confirmed the existence of multiple valence states of magnetic ions such as Fe2+:Fe3+:Fe4+ = 41:45:14 and Mn3+:Mn4+ = 88:12, within experimental limit. This triggers super-exchange and double-exchange interactions thereby contributing significantly to the dielectric and magnetic order parameters. At the same time, with increase in LSMO content an increase in AFM transition temperature (T-N) close to room temperature is observed. An irreversibility in ZFC-FC data is evidenced for T < 350 K along with an opening in M - H plot, indicating spin-glass behaviour and an onset of weak ferromagnetism in the composites. The latter is found to get enhanced significantly with increase in LSMO content and is also verified from Arrott plots. Further, confirmation to the intrinsic MD coupling is assisted by temperature and magnetic field variation of magnetodielectric effect (MD%) which shows enhanced MD effect effective at room temperature. This intriguing MD coupling could be attributed to inverse Dzyalonshinskii-Moriya interactions between magnetic ions present in the composite due to strong cross coupling. Lastly, from Landau free energy expression, the existence of biquadratic nature of magnetoelectric coupling ((PM2)-M-2) emerging from the coupling term 'gamma(PM2)-M-2' is established. At 300 K, gamma is similar to 1.6 x 10(-2) (emu/g)(-2) for BL70-30 and shows similar to 2 % MD response - a nearly eight-fold increase as compared to parent BFO. Hence, the above outcomes highlight the significance of the composite as a viable candidate for multifunctional applications



URL: https://www.sciencedirect.com/science/article/pii/S0022369725006122?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Applied Sciences
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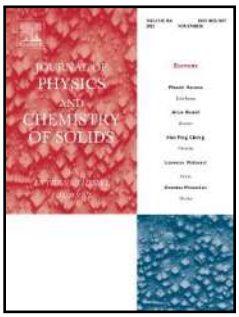
Journal Name: Journal of Physics and Chemistry of Solids **IF: 4.9**

Title: Probing lattice anharmonicity and thermal transport in nanocrystalline CoSb3 using Raman scattering

Author: A., Mohanty, Abhipsa; A., Das, Arpita; P.K., Deheri, Pratap Kumar; J., Khatei, Jayakrishna; D., Rout, Dibyaranjan; G.K., Pradhan, Gopal K.

Details: Volume 208, January 2026

Abstract: Understanding and controlling thermal conductivity is central to the development of high-performance thermoelectric materials. In this work, we investigate the lattice dynamics and thermal transport in nanocrystalline $CoSb_3$ using non-contact, optothermal Raman spectroscopy. Temperature- and laser power-dependent Raman measurements are employed to analyze phonon dynamics and extract anharmonic contributions from both three-phonon and four-phonon scattering processes. The temperature-induced redshifts of Raman-active phonon modes are modelled quantitatively using the Klemens-Balkanski formalism, incorporating both quasiharmonic thermal expansion and intrinsic anharmonicity. By evaluating the shift in Raman mode positions with respect to laser power and temperature, we estimate the lattice thermal conductivity of nanocrystalline $CoSb_3$ yielding a value of 2.65 ± 0.08 W/mK highlighting strong phonon scattering and thermal boundary resistance at grain interfaces. Our findings underscore the effectiveness of Raman spectroscopy as an analytical technique for probing localized phonon-mediated heat conduction in nanostructured thermoelectrics and offer valuable insights into the role of anharmonic phonon dynamics in determining thermal transport in skutterudites.



URL: https://www.sciencedirect.com/science/article/pii/S0022369725005815?via%3Dihub

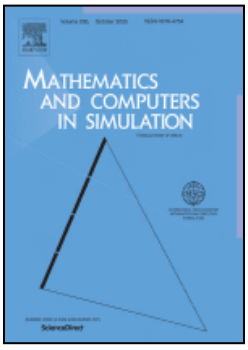
Journal Name: Mathematics and Computers in Simulation **IF: 4.4**

Title: Optimization of a price break policy and advertisement effort based non-instantaneous deteriorating inventory problem with partial backlogged via metaheuristic algorithms

Author: Mondal R.; Manna A.K.; Akhtar M.; Bhunia A.K.

Details: Volume 236, October 2025, Pages 221-247

Abstract: Repeated advertisements of an item in different media, displayed stock in a decorated showroom, and also price break policies play a vital role in an inventory control system. Also, the relationship between products' selling price and market demand is conflicting when all other factors are fixed. Thus, the incorporation of advertisement policy and price break facility in a business is more realistic. This work investigates an inventory problem for non-instantaneous deteriorating items with advertisement and displayed inventory level dependent demand under price break facility. Moreover, partially backlogged shortages and transportation cost for replenishing items are considered in the proposed inventory model. Based on the customer's demand and storage space of the shop, several cases and sub-cases are considered. In this study, different metaheuristic algorithms are considered for maximizing the average profit in each scenario. Then, considering one numerical example, the proposed model is justified. Finally, the sensitivity analysis is carried out to investigate the impact of model parameters on the policy of optimality and a fruitful conclusion is drawn.



URL: https://www.sciencedirect.com/science/article/pii/S0378475425001375?via%3Dihub

SCHOLARLY PUBLICATIONS
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Journal Name: Materials Chemistry and Physics **IF: 4.3**

Title: Exploring the role of strong electron correlation on the structural, magnetic, and electronic properties of CaNbO3/La2MnVO6 perovskite oxide heterostructure: An ab initio study

Author: Priyambada A.; Parida P.

Details: Volume 342, 15 September 2025, 130912

Abstract: In this work, we have investigated the structural, magnetic, and electronic properties at the interface of $CaNbO_3/La_2MnVO_6$ oxide heterostructure using density functional theory considering the strong correlation effect. The heterostructure is found to be stable in orthorhombic symmetry same as the bulk individuals. The heterostructure is designed along the (010) direction, hence it is associated with longitudinal strain along y-axis. Therefore, the variation in transition metal and oxygen bond lengths is more along (010) compared to other directions. As a result, the heterostructure possesses more distorted octahedra than the bulk compounds. The spin of the Nb atom present at the Nb–Mn interface is flipped due to strong ferromagnetic coupling, whereas, that in the V–Nb interface remain unchanged. The electronic behavior of the heterostructure is found to conducting, whereas, $CaNbO_3$ and La_2MnVO_6 are found to be insulator and conductor, respectively. The reason for the conducting nature of this heterostructure is partially filled Mn e_g orbital at the Fermi level.

URL: https://www.scopus.com/pages/publications/105004416836

SCHOLARLY PUBLICATIONS
School of Applied Sciences
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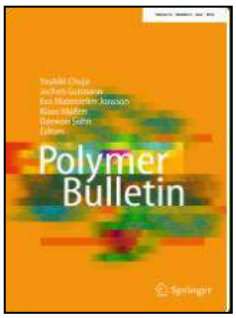
Journal Name: Polymer Bulletin **IF: 4.0**

Title: Mustard oil emulsion-infused gellan gum films: innovation in sustainable and functional food packaging

Author: M.K., Yadav, Mithilesh K.; A.K., Maurya, Anil Kumar; A., Seth, Akash; P., Maurya, Priyanka; K., Behera, Kartik; M., Jain, Monika; J., Tripathy, Jasaswini; A., Sand, Arpit

Details: Volume 1037, September 2025

Abstract: Currently, sustainable, functional food packaging materials are receiving increased attention due to the environmental and toxic impact of traditional petroleum-based plastics. This research explores innovative biobased edible films composed of gellan gum (GG) as the primary biopolymer, enriched with mustard oil emulsion (MOE) for active functionality. Key packaging characteristics were evaluated, including equilibrium moisture content, water vapor permeability, water solubility, biodegradability, mechanical strength, thermal behavior, and UV absorption properties. Scanning electron microscopy (SEM) analysis revealed non-uniform dispersion of MOE within the polymer matrix, while X-ray diffraction (XRD) confirmed GG–MOE interactions. With MOE loading from 0 to 9 wt.%, film opacity increased (5.34 ± 0.99–9.4 ± 0.08), transparency decreased, and barrier properties improved significantly: water absorbency (987.42 ± 0.94–227.14 ± 0.69), water vapor permeation (10.77 ± 0.21–9.22 ± 0.83) and equilibrium moisture content (44.55 ± 1.01–13.37 ± 1.03) all declined sharply. Notably, the incorporation of MOE unexpectedly enhanced biodegradation rates, with GG/MOE films showing greater weight loss than control films (GE0), despite the hydrophobic nature of mustard oil. This is attributed to polar interactions that facilitate water uptake and microbial access. In conclusion, GG-based edible films with MOE demonstrate promising functionality for eco-friendly food packaging applications.



URL: https://link.springer.com/article/10.1007/s00289-025-05988-w

SCHOLARLY PUBLICATIONS
School of Applied Sciences
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Journal Name: Scientific Reports **IF: 3.9**

Title: Sustainable carbon quantum dots from Mahua (Madhuca longifolia) for biomedical and environmental applications

Author: Soren, D.; Panda, J.; Swain, J.; Priyadarshini, A.; Swain, S.; Swain, J.; Pati, R.; Mohapatra, S.R.; Das, Y.; Samantaray, R.; Sahu, R.

Details: Volume 15, Issue 1, 30 September 2025

Abstract: With the goal of creating environmentally friendly therapeutic Carbon Quantum Dots (CQD), we explored the potential of a wildflower, Mahua (*Madhuca longifolia*), as a carbon source. The Mahua tree holds significant socio-econo mic importance in eastern and central India. Applying a conventional hydrothermal technique, we synthesized CQDs of a tiny size of ~ 5.77 nm. To authenticate the synthesized CQDs X-ray diffraction (XRD), FT-IR spectroscopy, X-ray photoelectron spectroscopy (XPS), zeta potential, transmission electron microscopy (TEM), atomic force microscopy (AFM), UV-visible spectroscopy, and photoluminescence spectra were employed. The synthesized CQDs exhibited exceptional stability over a storage period of one month and demonstrated pH-sensitive fluorescence behavior, making them suitable for biomedical and environmental applications. Metal sensing studies revealed that CQDs are highly selective in sensing Fe^{3+} ions in the presence of other transition and alkali metal ions. Antifungal assays conducted on pathogenic *Aspergillus Niger* and *Fusarium Oxysporum* showed significant inhibitory effects of CQDs. Cytotoxicity studies on dendritic cells revealed an IC50 value of 3.1 for CQDs, indicating their implied biomedical applications. Additionally, antibacterial assays against *Staphylococcus aureus* were studied using CQD extract. Together, these findings indicate a potential use of eco-friendly carbon-based QDs in environmental monitoring and biomedical diagnostics.

URL: https://www.nature.com/articles/s41598-025-87341-9

SCHOLARLY PUBLICATIONS
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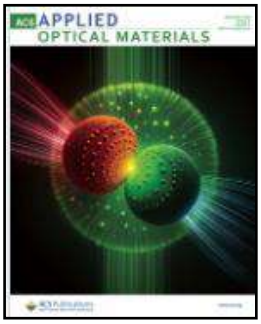
Journal Name: ACS Applied Optical Materials **IF: 3.8**

Title: Glucose and Ammonia Sensing Using Fluorescent Carbon-Smectite Clay Nanocomposites Synthesized by One-Pot Hydrothermal Method

Author: Mehena, G; Soren, D; Das, H; Tiwari, RK; Behera, JN; Pattojoshi, P; Deheri, PK

Details: Volume 3, Issue 9, September 2025

Abstract: We report the photoluminescence (PL) tuning of biomass-derived carbon nanoparticles (CNPs) through in situ nanocomposite formation with trioctahedral smectite clay mineral (Sm). The resulting carbon-clay nanocomposites (CNPCs) exhibit enhanced PL intensity in the visible region, while near-infrared and ultraviolet emissions are significantly suppressed. Fourier-transform infrared (FTIR) and X-ray photoelectron spectroscopy (XPS) analyses reveal that the interaction between CNPs and the clay matrix disrupts the extended sp2 domains on the CNP surface, introducing additional electronic states. These modifications to the bonding environment and electronic structure particularly enhanced n -> pi* and pi -> pi* band transitions, enabling multicolor luminescence within the visible spectrum, with a pronounced red fluorescence. This tailored emission behavior positions CNPCs as promising candidates for noninvasive fluorescent sensing applications. As nonenzymatic fluorescent probes, CNPCs show a concentration-dependent increase in PL intensity upon exposure to glucose and ammonia (as ammonium acetate) with good linearity. The nanocomposites are capable of detecting glucose at concentrations as low as 3.7 mM and ammonia down to 4.4 mu M. These results highlight the potential of CNPCs for real-time, noninvasive monitoring of biomarkers such as blood glucose and ammonia, offering valuable prospects for improved diabetes management and clinical diagnostics.



URL: https://pubs.acs.org/doi/10.1021/acsaom.5c00193

SCHOLARLY PUBLICATIONS
School of Applied Sciences
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Journal Name: Chemistry-a European Journal **IF: 3.7**

Title: Developing High-Rate Aqueous Zinc-Ion Batteries with Zn-Doped V10O2412H2O Cathode

Author: Thippeswamy, P. ; Sahoo, S. K. ; Hemavathi, N. j ; Giri, S. ; Ghosh, D.

Details: September 2025

Abstract: Aqueous zinc-ion batteries (AZIBs) have garnered attention as a cost-effective and safer alternative to lithium-ion batteries (LIBs). However, developing suitable cathode materials which can reversibly host Zn2 + ions remains a challenge. Herein we explore the effect of zinc doping into hydrothermally synthesized V10O24.12H2O (ZVO) and demonstrate that such doping enhances electronic conductivity and structural stability, leading to improved rate capability and cycling performance of ZVO as a cathode material for AZIBs. The effect of zinc doping in the V10O24.12H2O as a ZIB cathode has not been previously explored. The ZVO materials had a bundled rod-like morphology with a zinc content of 1.3% and an average oxidation state of 4.86 for the vanadium. DFT calculations further validate that Zn doping to the pristine V10O24 is thermodynamically favorable, which also improves the electronic conductivity of the ZVO. As a result, the Zn//ZVO cell exhibited superior specific capacity and improved rate performance over the pristine V10O24.12H2O (VO) electrode, with a high specific capacity of 359 mAh/g at 0.1 A/g and sustained 121 mAh/g at 5 A/g. The Zn//ZVO cell also showed commendable cycle stability with 90 mAh/g capacity retention over 1110 cycles, which was equivalent to the starting capacity of the pristine VO cathode.

URL: https://chemistry-europe.onlinelibrary.wiley.com/doi/10.1002/chem.202502204

SCHOLARLY PUBLICATIONS
School of Applied Sciences
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Journal Name: Numerical Heat Transfer; Part A: Applications **IF: 3.5**

Title: Magnetohydrodynamic Casson SWCNT-MWCNT/EG hybrid nanofluid flow over a stretching cylinder with Cattaneo-Christov double diffusion model

Author: Rath, C.; Nayak, A.

Details: Volume 86, Issue 21, 2025

Abstract: The present problem examines the flow features of a two-dimensional time-independent Casson hybrid nanofluid on a stretching cylinder with dual stratification and MHD effects. Heat and mass transfer effects are analyzed by utilizing the Cattaneo-Christov double diffusion scheme with entropy generation. Further, the energy losses due to viscous and Joulian dissipation are also considered in the problem. Due to the high thermal conductivity nature of the carbon nanotubes, which plays a crucial role in cooling systems, material sciences, electrical components and treatment of cancer cells, single and multi-walled carbon nanotube particles (*SWCNT*, *MWCNT*) are considered in the hybrid nanofluid. The carbon nanotubes are mixed with base fluid et hylene glycol (*EG*) to form the required hybrid nanofluid. Suitable transformations are adopted for transforming the non-linear PDEs to non-linear ODEs of the mathematical model. Then, the system of ODEs are resolved by utilizing bvp4c numerical approach in MATLAB software. The impact of the various flow pertinent parameters on the flow model are disclosed through graphs and tables and then explained elaborately. The important findings of the study reveal a reduction in the absolute value of coefficient of surface friction with the Casson and velocity slip parameters. The entropy generation rate (N_G) is diminished due to slip parameters, whereas the opposite effect is observed due to the *SWCNT* nanoparticle volume fraction. The thermal and mass relaxation parameters induce a significant amplification in the rates of heat and mass transport, respectively. Furthermore, it is observed that the heat and mass transfer rates of *EG*-based *SWCNT* – *MWCNT* hybrid nanofluid perform better than those of *EG*-based *SWCNT* nanofluid. The outcomes of the investigation exhibit an excellent agreement with the previously published results. The present analysis has applications in cancer therapy, microelectronics cooling, industrial heat generators, nuclear reactor maintenance, electrolytic condensers, and many more.

URL: https://www.tandfonline.com/doi/full/10.1080/10407782.2024.2353355#abstract

SCHOLARLY PUBLICATIONS
School of Applied Sciences
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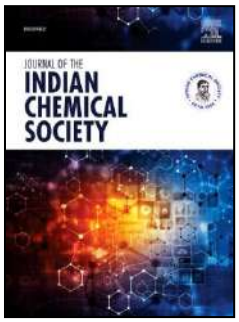
Journal Name: Journal of the Indian Chemical Society **IF: 3.4**

Title: Computational screening and experimental evaluation of potent polyphenols as anti-virulence agents against key proteins SrtA and CrtM of methicillin-resistant Staphylococcus aureus

Author: S., Mohanty, Sweta; S., Patnaik, Saswati; S., Mishra, Sweta; B.P., Rath, Bibhu Prasad; C.K., Mohanty, C. K.

Details: Volume 102, Issue 10, October 2025

Abstract: The rise of methicillin-resistant *Staphylococcus aureus* (MRSA) as a multidrug-resistant pathogen underscores the urgent need for alternative therapeutic strategies that go beyond traditional antibiotics. The pathogenicity of MRSA is largely attributed to its ability to form biofilms and produce the antioxidant pigment staphyloxanthin. Therefore, targeting essential virulence factors such as SortaseA (SrtA) and 4,4′-diapophytoene synthase (CrtM) offers a promising anti-virulence strategy that could mitigate pathogenicity while reducing resistance development. In this study, we evaluated the potential of plant-derived polyphenols as anti-virulence agents against MRSA using an integrated computational and experimental approach. *In silico* results confirmed that compounds like Naringin (NAR), Flavone (FLV) and Baicalein (BAI) demonstrated strong binding affinities and stable interactions with both targets. Further the *in vitro* results indicate that NAR exhibited potential antimicrobial activity, significantly disrupted MRSA biofilms and inhibited pigment production. Our findings support the potential of NAR as an effective anti-virulence agent targeting both SrtA and CrtM, offering a novel therapeutic avenue for managing MRSA infections.



URL: https://www.sciencedirect.com/science/article/abs/pii/S0019452225004650?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Applied Sciences
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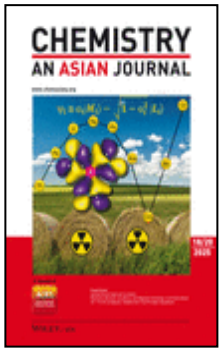
Journal Name: Chemistry - An Asian Journal **IF: 3.3**

Title: Development of UiO-66 and ZIF-8 MOF Nanocarriers for Anticancer Drug Delivery in Breast Cancer Cells

Author: A., Priyadarshini, Anulipsa; D.K., Senapati, Deepak Kumar; N., Das, Niharika; S., Gupta, Sonali; J., Swain, Jaykishon; D., Samal, Debadutta; K.C., Barick, Kanhu Charan; R.K., Sahu, Rojalin K.

Details: September 2025

Abstract: Metal-organic frameworks (MOFs), characterized by their extensive surface area, biocompatibility, and pH-sensitive degradation have emerged as promising candidates for drug delivery systems (DDSs). This study focused on the development of zinc based zeolitic imidazolate framework (ZIF8) and zirconium-based framework (UiO-66) MOFs as effective nanocarriers for delivery of broad-spectrum chemotherapeutic drug, doxorubicin hydrochloride (DOX), aiming to mitigate adverse side effects in breast cancer treatment. The nanocarriers, ZIF-8 and UiO-66 achieved a maximum drug loading efficiency of about between 79% and 75% at a drug-to-particle ratio of 1:10, and exhibited their pH-responsive release, which is essential for cancer therapy. The in vitro therapeutic efficacy of developed DDSs was explored on breast cancer (MCF-7 and MDA-MB-231) cell lines as well lung normal cells (WI26VA4). From confocal microscopic studies, it has been observed that a substantial amount of DOX is internalized into the cancer cells in a time-dependent manner. It is noteworthy to mention that both the developed drug formulations (DOX@UiO-66 and DOX@ZIF-8) showed dose-dependent toxicity towards cancer cell lines. Moreover, the cell viability studies performed with pure ZIF-8 and UiO-66 MOFs against normal as well as cancer cells demonstrated their biocompatibility nature even at a high concentration of 50 µg/mL. These findings underscore the potential of ZIF-8 and UiO-66 MOFs as effective and biocompatible platforms for drug delivery in breast cancer therapy.



URL: https://aces.onlinelibrary.wiley.com/doi/10.1002/asia.202500672