SCHOLARLY PUBLICATIONS
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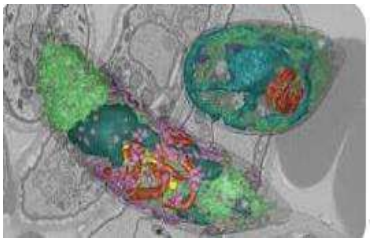
Journal Name: Nature Communications **IF: 14.7**

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

Journal Name: Journal of Alloys and Compounds **IF: 6.3**

Title: Enhanced low-frequency microwave absorption using MAPbIâ‚ƒ@rGO nanocomposites

Author: Barik R.; Das D.; Barik R.; Sahoo S.; Bhuyan M.; Sahu P.; Parashar S.K.S.; Sahoo D.

Details: Volume 1037, August 2025

Abstract: $MAPbI_3$@rGO nanocomposites were synthesized and incorporated into an epoxy matrix to develop a robust material with enhanced microwave absorption properties. Structural and morphological analyses using XRD, FTIR, FE-SEM, HR-TEM, and XPS confirmed the successful formation of the $MAPbI_3$@rGO composites, revealing uniform dispersion of $MAPbI_3$ nanoparticles on rGO sheets, reduced particle size, and consistent elemental composition. The performance of $MAPbI_3$@rGO composite was evaluated in the X-band with a frequency range (8.2–12.4 GHz), showing a significant improvement in microwave absorption with the inclusion of reduced graphene oxide (rGO). The as-obtained perovskite, amalgamated with rGO exhibits an extremely low reflection loss value of −83 dB at 8.7 GHz when the absorber thickness is 4 mm, ranking it as one of the most attractive absorbers reported to date. The $MAPbI_3$@rGO composite demonstrates an impressive broadband response, covering a wide frequency range of 8–10 GHz, making it highly suitable for advanced high-frequency applications. Mechanisms, including dielectric loss, various internal reflections, effective impedance matching, and synergistic interactions within the composite structure, are responsible for the observed enhanced absorption performance. These results highlight the potential of materials based on $MAPbI_3$@rGO for applications involving microwave absorption.

URL: https://www.sciencedirect.com/science/article/pii/S0925838825038198?via%3Dihub

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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

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Journal Name: Inorganic Chemistry Communications **IF: 5.4**

Title: Structural, microwave, and X-band frequency response EMI shielding of Al substituted calcium titanate ceramics

Author: Das D.; Rout S.; Samal R.R.; Dikshit A.P.; Parashar K.; Parashar S.K.S.

Details: Volume 1037, August 2025

Abstract: The superior absorption capacity, minimum reflection loss, high temperature resistance and compact dimensions provide significant hurdles in tackling electromagnetic concerns in military systems and stealth missile technologies. This study explores the impact of aluminum (Al) doping on the structural, optical, and microwave absorption characteristics of calcium titanate ($CaTiO_3$). The structural, morphological, optical and electromagnetic shielding efficiency are thoroughly analyzed within the X-band frequency range (8.2–12.4 GHz). Powder X-ray diffraction (XRD) and Raman spectroscopy techniques verify the formation of a well-defined crystalline phase match with the JCPDS card No. 78–1013 with an orthorhombic structure (Pbnm space group) of the materials. The crystallite size was found to be 32.2 nm for x = 0 and was increased from 60 nm to 75.7 nm with increasing of Al^{3+} doping from x = 0.02 to x = 0.10. The FESEM micrographs reveal a well dense material with a little porosity with average grain sizes of 1.16, 1.86, 1.72, and 1.82 µm for x = 0.0, 0.02, 0.05, and 0.10. Vector Network Analyzer (VNA) measurements demonstrate that the sample with x = 0.10 exhibits the total shielding effectiveness (SE_T) of 13 dB and a minimum reflection loss of −41 dB at ∼9.06 GHz with a thickness of 1.5 mm. The value of ε' was found to be 12.25 at 11.2 GHz for x = 0.05. These results suggest that Al-doped calcium titanate possesses the potential to efficiently absorb up to 99.99 % of electromagnetic interference (EMI) radiation.

URL: https://www.sciencedirect.com/science/article/pii/S138770032501144X?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

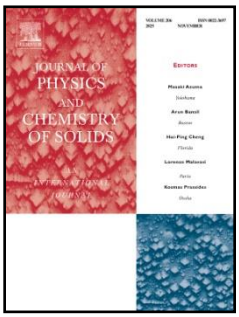
Journal Name: Journal of Physics and Chemistry of Solids **IF: 4.9**

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

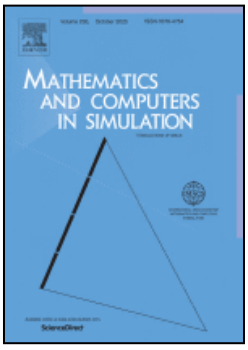
Journal Name: Mathematics and Computers in Simulation **IF: 4.4**

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.



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Journal Name: Journal of Physics and Chemistry of Solids **IF: 4.3**

Title: Correlation-driven interface magnetism and conductivity in CaNbO3/Ca2VMoO6 perovskite oxide heterostructure: An ab initio approach

Author: Priyambada A.; Parida

Details: Volume 203, August 2025

Abstract: In this work, we investigate the effect of strong electron correlation on the structural, magnetic, and electronic properties at the interface of the $CaNbO_3/Ca_2VMoO_6$ heterostructure using the density functional approach. The heterostructure is designed along the (010) direction. The relaxed heterostructure is also found to be stable in the orthorhombic phase as the bulk individuals. The transition metal–oxygen bond lengths vary more along the y-axis, than the other two perpendicular axes. This makes the octahedra in this heterostructure more distorted than that of bulk constituents. The individual compounds, i.e., $CaNbO_3$ and Ca_2VMoO_6, exhibit G-type antiferromagnetic and ferromagnetic behavior, respectively, at their ground state. Conversely, in the heterostructure, $CaNbO_3$ experiences a spin-flip, converting the compound to a ferromagnetic material, whereas, the spin alignment of Ca_2VMoO_6 remains unchanged. The spins of $CaNbO_3$ and Ca_2VMoO_6 are aligned in the opposite direction, making the interface of the heterostructure antiferromagnetic. The electronic behavior of the heterostructure is obtained to be metallic. The reason behind the metallicity is found to be the partially occupied t_{2g} orbital of Mo atoms, which is clear from the spin-orbital projected density of states, and orbital-projected electronic band structure diagrams with U = 7 eV.

URL: https://www.sciencedirect.com/science/article/pii/S0022369725001829?via%3Dihub

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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

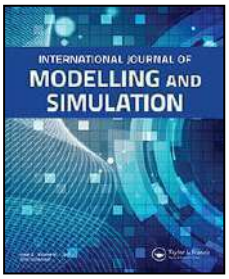
Journal Name: International Journal of Modelling and Simulation **IF: 3.1**

Title: Qualitative analysis of magnetohydrodynamics Powellâ€“Eyring fluid with variable electrical conductivity

Author: Swain S.; Sarkar S.; Sahoo B.; Makinde O.D.

Details: Volume 45, Issue 2, 2025

Abstract: The non-Newtonian fluid model helps to visualize the fluid movements in modern industrial materials for the enhancement of work productivity. Therefore, this numerical investigation examines the flow behaviour of Powell–Eyring fluid over the stretching sheet with variable electric conductivity and thermal radiation. We have used the Lie group analysis method to reduce the governing momentum and energy equations into ordinary differential equations (ODEs). The resultant system is then numerically solved using the shifted Chebyshev collocation method. The accuracy of the numerical method has been verified by comparing the current work to existing literature, and it is found to be in excellent agreement. The effects of rheological parameters like stretching sheet parameter, magnetic field parameter, material parameters, suction/injection parameter, radiation parameter and Prandtl number on fluid velocity and temperature profiles are examined in detail through tables and graphs. The main motivation behind this study is to examine the effects of Lorentz force on fluid velocity and temperature in the presence of thermal radiation, which has several industrial applications. It is observed that the velocity profile decreases when the magnetic field parameter increases. Furthermore, it is noticed that increasing thermal radiation parameter increases the temperature profile.



URL: https://www.tandfonline.com/doi/full/10.1080/02286203.2023.2231613

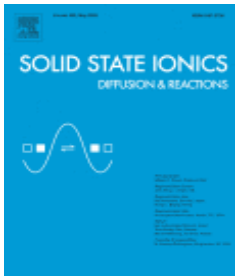
Journal Name: Solid State Ionics **IF: 3.0**

Title: Exploring structural, optical, dielectric and electrical attributes of a La based complex perovskite

Author: Priyadarshini L.; Biswal L.; Rout S.; Moharana K.; Parida A.K.; Choudhary R.N.P.; Satpathy S.K.

Details: Volume 45, Issue 2, 2025

Abstract: A rare-earth based novel compound with a disordered perovskite structure has been synthesised using the conventional solid-state reaction approach. The structural phase of the compound is analysed using room temperature X-ray diffraction (XRD) data. The refinement of XRD data suggested formation of compound in trigonal phase with R-3c symmetry. Position of peaks in Raman spectra obtained at room temperature further support the proposition of above structure and symmetry of formation. Using scanning electron microscope (SEM) images, the microstructure of the compound and the surface morphology is revealed. EDX analysis presented semi-quantitative information on distribution and weight percentage of elements present, from which the synthesis of the expected compound is substantiated. Examination of optical characteristics via UV–Visible absorption spectroscopy revealed a band gap of 3.2 eV suggesting possible potential applications in optoelectronic and photovoltaic devices. The electric polarisation and relaxation phenomena prevailing in the material as a function of frequency and temperature are extensively studied using data acquired via complex impedance spectroscopy (CIS) technique. A temperature and frequency stable dielectric response in high frequency region recommends use of compound for application at high frequency and temperature. Dominating bulk contribution to overall electrical response and negative temperature coefficient of resistance (NTCR) behaviour is observed. The frequency-dependent ac conductivity data adheres to Jonscher's power law. To estimate the activation energy, which facilitates the identification of the specific charges involved in the ac conduction process, the temperature-dependant ac conductivity data is utilised



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