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Dear Readers,

Greetings from Mapana Journal of Sciences,

The editorial team of Mapana Journal of Sciences is delighted to present you with the fourth issue of 2023. By publishing pioneering research and review articles in the vast domain of science, Mapana Journal of Sciences (MJS) always intends to uphold its commitment to cultivating scientific temper. We believe that the present issue would be remarkable in this continuing endeavour, sustaining the tradition of showcasing notable articles exploring the captivating domains of science.

In this issue, we have four articles discussing innovative materials, their properties and applications. Harish *et al.*, provide valuable insights into the thermal stability and degradation kinetics of composites consisting of Isophthalate-based unsaturated polyester resin and lead monoxide filler. The observed two-stage degradation process, the impact of filler concentration on the initial degradation temperature, and the detailed analysis using the Freeman-Caroll and Horowitz-Metzger methods contribute to a comprehensive understanding of the behaviour of these composites under thermal stress. These findings are crucial for optimising the formulation and application of such materials in various industrial contexts where thermal stability is a critical factor. Anitha *et al.* investigated the photo-electrochemical water-splitting behaviour of ZnO and TiO_2 phthalocyanines synthesised via hydrothermal methods. The study characterises crystallinity, surface morphology, and light absorption properties of the materials, revealing ZnO phthalocyanine as a more effective photoelectrocatalyst than TiO_2 phthalocyanine, attributed to its smaller band gap and structural features enhancing charge carrying capacity and surface area. This research holds significance in renewable energy technologies as it offers insights into efficient photocatalysts for water-splitting applications.

The study conducted by Sithi *et al.*, presents a novel approach to forensic analysis of tool paint using non-destructive methods, mainly focusing on detecting strontium and barium sulphate as perceptive factors. The studies employing UV-Vis, FTIR, and Raman spectra, along with SEM and XRD, reveals distinctive features in tool paints, offering insights into their composition and potential forensic

applications. The results highlight the effectiveness of XRD in characterising paint samples, especially in correlation with other analytical methods, thereby enhancing the understanding of tool paint composition and aiding forensic investigations. Vinod *et al.*, report conducting polymer-based gas sensors for NO_2 detection and present crucial findings on the impact of washing on the chemical composition and structure of the material. The insights gained from XRD and FTIR analyses, coupled with electrical conductivity evaluations, contribute to understanding the sensor's performance and reliability. The study emphasises the importance of addressing washing effects on gas sensing materials and provides valuable information for enhancing sensor technology, particularly for low ppm concentration detection of NO_2.

From Physics, the study by Kagali *et al.*, offers insights into the wave-particle duality of quantum particles by examining the renowned double-slit experiment. Departing from traditional explanations, they ground their analysis in rigorous quantum mechanics, particularly the path integral formulation, demonstrating how quantum mechanical amplitudes for particle propagation yield observed interference patterns without relying on assumptions of plane or spherical waves. Their exploration extends to the classical limit, revealing the gradual transition of interference patterns to classical behaviour as slit dimensions surpass particle wavelengths, thereby underscoring the intrinsic connection between quantum mechanics and classical physics. Their work deepens our understanding of fundamental physics and paves the way for further exploration into the mysteries of quantum behaviour and its broader implications. From Astrophysics, Tenneti Ramprasad presents a comprehensive investigation into a Bianchi type-III anisotropic cosmological model incorporating cloud strings and an electromagnetic field within the framework of general relativity. By deriving exact solutions from field equations, the study explores scenarios with constant and linearly varying deceleration parameters, shedding light on the dynamics of physical parameters through graphical representations. Ramprasad's research contributes to our understanding of early universe evolution, highlighting the significance of anisotropic models in cosmology and providing insights into the role of electromagnetic fields and cosmic strings. This work expands theoretical cosmology and offers implications for contemporary observational studies, aligning with recent advancements in understanding the universe's structure and dynamics.

Two articles from Mathematical Sciences come across the exciting research area of graph theory. "Eulerian and Unicursal Soft Graphs" by Jose *et al.*, discusses the notion of soft graphs and present characterisations on Eulerian soft graphs, as Eulerian graphs play a significant role in network science and all its related fields. Another article, "Changing and Unchanging the Geodetic Number: Edge removal" by Antony *et al.*, studies effect of the graph operation, edge removal, on the geodetic number of several classes of graphs.

From Life Sciences, Benjamin *et al.*, provide a detailed account of the butterfly diversity at All Saints' College campus in Thiruvananthapuram, Kerala, India. The presence of rarely spotted butterflies and the overall high diversity density underscore the ecological richness of the campus. The dominance of the Nymphalidae family further highlights the importance of specific habitats within the campus. The findings emphasise the need for ongoing conservation efforts to preserve habitats and flora, which are crucial for sustaining and enhancing butterfly diversity in similar ecosystems. The study contributes valuable insights to the broader field of biodiversity research and encourages a focus on local conservation initiatives.

A comprehensive review by Mawazzan *et al.*, serves as a valuable resource, shedding light on the theoretical foundations and recent advancements in flexible thermoelectric materials. The exploration of various material categories and the acknowledgement of performance challenges contribute to a nuanced understanding of the current state of the field. The review concludes by offering a forward-looking perspective on the future of flexible thermoelectric materials, especially in the context of wearable thermoelectrics, paving the way for continued innovation in this dynamic and evolving field.

As we are closing Volume 22 of MJS, with this issue, we extend our heartfelt appreciation to all the authors, reviewers, editorial board members, and section editors whose contributions have made this publication possible. Mapana takes pride in spreading light to significant endeavours that foster scientific culture and research. We eagerly anticipate embarking on future ventures of knowledge and discovery. We expect to come up with Volume 23, offering more diversity of topics and disciplines, exemplifying the interdisciplinary nature of contemporary scientific research.

Dr Manoj Balachandran

Editor