

# Editorial: Materials for multidisciplinary applications

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It's my pleasure to introduce the second issue of EMMR journal for 2026. This issue contains the ten papers, which cover two review papers including self-healing materials for wearable electronics and machine learning (ML) for prediction of magnesium alloys' mechanical properties, and eight research papers such as metal alloy microstructure analysis, high-entropy alloys tribological properties, mortar and concrete durability, thermal insulation polymer composites, functional textiles, fibre-reinforced epoxy composites and lead-free perovskite solar cells.

Recently, wearable electronics especially for the sensing monitoring have attracted considerable attentions because of their flexible, stretchable skin-adherent property. However, the bending, moisture, friction and scratches during operation will severely damage their functions. In this situation, the development and advance of novel self-healing materials are very important. Singh<sup>1</sup> comprehensively reviewed the preparation, healing efficiency, stretchability, tensile strength, electrical performance, and environmental stability of common four major self-healing materials contained graphene-based systems, MXene-integrated nanocomposites, bio-inspired supramolecular elastomers, and dielectric-assisted self-healing materials. Besides, the limitations and challenges like integration, environmental compatibility, and long-term device durability have also been discussed. The future perspective is also predicted for guiding the practical application of self-healing materials in next-generation wearable electronics. If you are interested in the wearable electronics, this review paper will be a good choice.

Magnesium (Mg) alloys are widely used in the fields of automobile, electronics, and medical equipment, arising from their light-weight, high strength-to-weight ratio, high damping characteristics, and good recyclability. Nevertheless, their microstructures and mechanical properties are highly dependent on the element composition, purity, and process parameters, which brings the difficulty in the preparation of magnesium-based materials. Recently, ML as one of the artificial intelligences (AI) technology provide the possibility to predict the mechanical properties of magnesium alloys instead of conventional experimental works that consume time, energy, and cost. Amalan *et al.*<sup>2</sup> reviewed recent research on the microstructures, density and hardness, tensile strength, corrosion and wear resistance obtained from ML method such as artificial neural network, convolutional neural network and also indicated its possible limitations in the materials science to broaden application. This

paper could make us deeply understand the adoption of emerging AI technology in the field of materials science.

Li *et al.*<sup>3</sup> numerically designed a fully inorganic double-layer lead-free perovskite solar cells (PSCs) and optimised composition-dependent bandgap tuning, interfacial defect-density tolerance, transport-layer thickness variation, and back-contact energetics with the one-dimensional solar cell capacitance simulator model of a novel fluorine-doped tin oxide/GO/Cs<sub>2</sub>SnI<sub>6-n</sub>Br<sub>n</sub>/copper(I) oxide/metal PSC. Their findings guild a strategic blueprint for rational design of stable, high-efficiency PSCs, and indicate the importance of parameter optimisation in developing lead-free perovskite photovoltaic.

Natural materials are normally made from the eco-friendly sources, which are less toxic, biodegradable, and abundant, and beneficial to the environment and human health. They have gradually received widespread attentions in various applications. Li *et al.*<sup>4</sup> used the anthocyanins pigments extracted from grouper root to dye the cotton fabrics modified by 3-chloro-2-hydroxypropyltrimethylammonium chloride and chitosan, which significantly enhance their dyeing performance and functionality. Besides, it also exhibited a good wash and rubbing fastness, a high ultraviolet protection factor and an anti-oxidant activity, and an excellent antimicrobial efficacy against *Escherichia coli* and *Staphylococcus aureus*. Their work gives us an opportunity of natural dyes in the development of durable, functional textiles. Yuvaraju *et al.*<sup>5</sup> studied the tensile, flexural, and water absorption properties of abaca/epoxy, sisal/epoxy, and abaca–sisal/epoxy hybrid composites, which contributes the valuable insights in optimising the natural fibre composites for high-performance and sustainable applications in automotive, structural, and aerospace sectors.

Nebbar<sup>6</sup> fabricated six composites composed of poly(methyl methacrylate)-based polymer composites reinforced with red brick waste and palm date leaf fibres, studied their thermal insulating performance and mechanical strength, and explored the feasibility of the application as the building materials in the arid regions, especially in regions with arid climates and extreme temperature fluctuations, like in arid areas of Algeria.

The durability of concrete and mortar directly determines the safety and service life of engineering structures, and is the core performance to ensure the long-term reliable operation of infrastructure and

masonry. Li *et al.*<sup>7</sup> found that waste glass powder and waste glass sand could significantly reduce both mass loss rate and compressive strength corrosion resistance coefficient at identical cycles, and improve the sulfate resistance, further enhancing the durability of pervious concrete. Akhila *et al.*<sup>8</sup> adopted mineral admixtures including silica fume and ground granulated blast furnace slag (GGBFS) and chemical admixtures contained bipolar corrosion inhibitors and waterproofing compounds to obviously enhance the durability of mortar matrix.

Das *et al.*<sup>9</sup> fabricated two new refractory high-entropy alloys of WMoVCrTa and W<sub>23</sub>Mo<sub>23</sub>V<sub>17</sub>Cr<sub>8</sub>Ta<sub>7</sub>Fe<sub>22</sub>, which exhibited superior wear resistance by determining tribological property including wear coefficient and coefficient of friction. This makes them great potential applications in the nuclear and aerospace industries to resist erosion by particulates in high-speed and high-temperature.

Jothi *et al.*<sup>10</sup> indicated the cryogenic manufacture could improve the surface integrity and microstructural stability of Hastelloy C-276 that was a nickel-based superalloys in demanding industrial applications.

Based on the aforementioned, I hope you will enjoy the contents of this issue, and find the scientific and technical information in your research.

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