

Editorial: Surface coating in metal and metal alloy for anti-corrosion

Hongbo Gu

Shanghai Key Lab of Chemical Assessment and Sustainability, School of Chemical Science and Engineering, Tongji University, Shanghai, China
(hongbogu2014@tongji.edu.cn)

New semester stars, it's my pleasure to introduce the third issue of *EMMR* journal for 2025. This issue contains six papers, which cover the metal and metal alloy manufacture and their surface coating for anti-corrosion as well as preparation of eco-friendly cementitious materials and wound healing biopolymeric nanofiber materials.

Metal and metal alloys have been widely applied in the aerospace, automobile, and electronics for their high specific strength, great machinability, and strong thermal conductivity. However, most of them are prone to oxidation and corrosion, which severely limit their applications. Ma *et al.*¹ generated a new type of high-efficiency corrosion inhibition of cerium tartrate by combining rare earth cerium and organic acid groups into electrolyte, to prepare a ceramic oxide coating on the surface of aluminum alloy by microarc oxidation technique, which provided 2A12 aluminum alloy with a good corrosion resistance property by varying the concentrations of cerium tartrate.

To decrease the friction loss of piston-ring-liner assembly and increase the engine's efficiency, Tyagi *et al.*² applied a hybrid coating of ceramic and agriculture waste to develop sustainable high-velocity oxy-flame-sprayed composite coatings on the steel substrate. They evaluated the effect of pre- and post-annealing heat treatment on coatings by sliding wear rate, corrosion, and residual stress. The results revealed significant enhancements in mechanical properties from the work hardening and microstructural change.

Recently, TiAl intermetallic has been widely applied in automobile and aerospace thermal protection systems, such as aerospace skin materials because of their excellent anti-corrosion and anti-oxidation and creep resistance at high temperatures. Even though accumulative roll bonding (ARB) method is recognized as a promising severe plastic deformation method for metal alloy production, it is rarely used in the Al–Ti intermetallic fabrication. Basha *et al.*³ produced layered Al–Ti systems with fine-grained microstructures by ARB technique. By studying the bonding and alloying kinetics within the Al–Ti alloy system, they comprehensively explored interactions between Al and Ti atoms, which provided a guidance for achieving Al–Ti intermetallic with high yield rates and minimized defects.

Besides, Velayudhan *et al.*⁴ developed a binder-free selenium nanoparticle-decorated cathode by integrating a bioanode to enhance microbial fuel cells' (MFC) performance by optimizing the MFC configuration and surface modification of the electrode materials. Finally, they achieved a record-high power density of 7000 mW/m², which was significantly higher than that of C–Se–G (4761 mW/m²) and the bare graphite electrode. Their findings are beneficial for developing cost-effective, high-performance MFCs for sustainable wastewater treatment and renewable energy generation.

Syed *et al.*⁵ fabricated a novel biopolymer composite of gelatin/poly(lactic acid)/nanocrystalline cellulose loading with fenugreek extract, which exhibited a good antibacterial activity and sustained drug release capability. They could be potentially employed in the wound healing patches.

Yan *et al.*⁶ developed an eco-friendly alkali-activated binary system consisting of hemihydrate phosphogypsum and ground granulated blast furnace slag with the enhanced mechanical strength, the compensatory fluidity and consistency, and the optimized durability. These materials provided a new method for sustainable development of cementitious materials and environmental conservation.

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

Acknowledgements

The author thanks the support from Shanghai Science and Technology Commission (19DZ2271500).

REFERENCES

1. Ma G, Li Z, Wang X, Shi D and Niu J (2025) Corrosion behavior of microarc oxidized CeO₂–Al₂O₃ composite coatings on 2A12 Al alloy. *Emerging Materials Research* 14(3): 235–246, [10.1680/jemmr.23.00180](https://doi.org/10.1680/jemmr.23.00180).
2. Tyagi A, Dhull S, Nair R *et al.* (2025) Assessment of surface texturing of sustainable HVOF sprayed Al₂O₃+C powder coating. *Emerging Materials Research* 14(3): 247–254, [10.1680/jemmr.24.00151](https://doi.org/10.1680/jemmr.24.00151).
3. Basha A, M G, R VV, Panda S and Baghdad A (2025) Fabrication and characterization of Ti–Al intermetallics through accumulative roll bonding. *Emerging Materials Research* 14(3): 255–266, [10.1680/jemmr.24.00047](https://doi.org/10.1680/jemmr.24.00047).

-
4. Velayudhan J and Subramanian S (2025) Binder-free SeNP-decorated cathodes and bioanodes for dual-chambered microbial fuel cells. *Emerging Materials Research* **14(3)**: 267–279, [10.1680/jemmr.24.00195](https://doi.org/10.1680/jemmr.24.00195).
 5. Syed MH, Qubro KA, Khan MMR et al. (2025) Assessing morphological effect on antimicrobial activity using needleless electrospinning. *Emerging Materials Research* **14(3)**: 280–291, [10.1680/jemmr.25.00053](https://doi.org/10.1680/jemmr.25.00053).
 6. Yan G, Lu Z and Feng B (2025) Basic properties, durability and microstructure of alkali-activated hemihydrate phosphogypsum incorporating with ground granulated blast furnace slag (GGBFS). *Emerging Materials Research* **14(3)**: 292–303, [10.1680/jemmr.25.00026](https://doi.org/10.1680/jemmr.25.00026).