frontiers | Frontiers in Coatings, Dyes and Interface Engineering

TYPE Editorial
PUBLISHED 04 March 2025
DOI 10.3389/frcdi.2025.1568436

OPEN ACCESS

EDITED AND REVIEWED BY
Shuo Yin,
Trinity College Dublin, Ireland

*CORRESPONDENCE
Robert J. K. Wood,
r.wood@soton.ac.uk

RECEIVED 29 January 2025
ACCEPTED 18 February 2025
PUBLISHED 04 March 2025

CITATION
Wood RJK, Baker MA, Endrino JL and Thomas KRJ (2025) Editorial: Frontiers in coatings, dyes and interface engineering: inaugural collection.
Front. Coat. Dyes Interface Eng. 3:1568436.
doi: 10.3389/frcdi.2025.1568436

Editorial: Frontiers in coatings, dyes and interface engineering: inaugural collection

Robert J. K. Wood[1]*, Mark Alan Baker[2], Jose L. Endrino[3] and K. R. Justin Thomas[4]

[1]Department of Mechanical Engineering, School of Engineering, University of Southampton, Southampton, United Kingdom, [2]School of Engineering, University of Surrey, Guildford, United Kingdom, [3]Department of Engineering, Loyola Andalusia University, Seville, Andalusia, Spain, [4]Organic Materials Laboratory, Department of Chemistry, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, India

KEYWORDS

coatings, dyes, interface engineering, hard film and coatings, dyes and pigments, engineered surfaces and interfaces, soft coating

Editorial on the Research Topic
Frontiers in coatings, dyes and interface engineering: inaugural collection

This is a very exciting Research Topic of the first papers published in CDIE that look at functional surfaces and interfaces. This Research Topic is written by leading researchers and detail innovative investigations. These papers and reviews will start to define this new journal and we hope readers are encouraged to submit research papers to CDIE. The journal focuses and serves researchers interested in coatings, dyes and interface engineering and we are pleased these areas are covered by this inaugural collection of 9 papers, The papers look at coatings for the applications of micro-batteries, surgical screws, high temperature, tribology in electric vehicles (EVs) applications and wear resistant nickel matrix coatings.

For example, a mini-review (Curcio et al.) looks at Pulsed Laser Deposition (PLD) for the design and development of micro-batteries while a full review paper offers a succinct synthesis of recent advancements in High Entropy Oxides research, (Lee and Cai), spanning from processing techniques to mechanical behaviours under extreme conditions.

Another review article focuses on electric vehicles (EVs), Lee et al. which are the future of transport, but to really take off, they have some tough technical challenges to overcome, especially when it comes to their moving parts like gears and bearings. Unlike traditional gasoline-powered cars, EVs work differently and are much heavier. They deliver a large amount of torque right from the start and hit peak efficiency at high speeds. That is excellent for performance purposes, but it also puts a large amount of stress on mechanical components, leading to wear, fatigue, and scuffing. Here is where advanced hard coatings come into play. Clearly, new advanced hard coatings can handle the unique demands of EVs. Hard coatings could be designed to resist heat, wear, and friction, making parts last longer and work better under heavy loads and low-speed conditions and they could become game changers.

One research article contribution details how the addition of Cr2C3 hard particles into Ni brush plated metal-matrix composite coatings increases wear resistance by 60% compared to Ni-only coatings, Isern et al.. The presented work could potentially lead to alternatives to hard chrome, which is environmentally unfriendly and unsafe.

The Research Topic also includes papers on important interface phenomena. Work on the dry sliding of zirconia dioxide couples shows that self-mated dry sliding is not advised unless low loads are applied Bailey and Sun. PDMS is a material used in MEMS and other small-scale devices and developing an understanding of its elasticity, adhesion, and friction behaviour is very important, Lee et al. An atomic force microscopy (AFM)-based method to quantify elastic and tribological properties in single asperity contacts (quasi-static and sliding) under dry conditions has demonstrated that the friction and adhesion behaviour of PDMS are inter-related and are affected by the elastic deformation of PDMS junctions. A detailed FTIR study of the adhesion failure between hydroxyapatite coatings has concluded that failure is caused by the selective removal of non-apatite environments at the metal implant-hydroxyapatite interface. The method presented also provides important information on the apatite bonding at the interface, indicating the expected adhesion strength, Pereyra et al. This work underpins efforts to prevent additional patient interventions and the associated costs.

Among the various strategies available for the encapsulation of active ingredients in the pharmaceutical industry, Pickering emulsions stand out as efficient alternatives. Ramos et al. investigated the encapsulation of ibuprofen using Pickering emulsions stabilized by silica particles. Their study demonstrated remarkably high encapsulation rates, reaching up to 99% for ibuprofen concentrations ranging from 1.6 mg/mL to 6 mg/mL of paraffin. Moreover, the encapsulation efficiency was shown to remain stable over a 90-day aging period and even after dilution. The findings also highlight the potential for developing reverse emulsions, which could enable the encapsulation of polar active ingredients, such as insulin.

In dye-sensitized solar cells, the processes of dye regeneration and back electron transfer (recombination) play critical roles in determining overall efficiency. Ávila and Cerdá conducted a comparative study on iodine-based electrolytes using electrochemical measurements and benchmarked their performance against commercial electrolytes. Their research provided valuable insights into the thermodynamics of competitive electron transfer processes in solar cells sensitized by natural dyes, contributing to a deeper understanding of these systems' functionality and optimization potential.

Author contributions

RW: Writing–original draft. MB: Writing–original draft. Jose L JE: Writing–original draft. K R Justin Thomas: Writing–original draft.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

Publisher's note