**Editorial for the Frontiers in Coatings, Dyes and Interface Engineering:**

**Inaugural collection**

RJK Wood (Chief Field Editor, CDIE), KR Justin Thomas (Speciality Chief Editor, CDIE), Jose L Endrino (Speciality Chief Editor, CDIE) and Mark A Baker (Speciality Chief Editor, CDIE). [Frontiers | Frontiers in Coatings, Dyes and Interface Engineering: Inaugural Collection](https://www.frontiersin.org/research-topics/60905/frontiers-in-coatings-dyes-and-interface-engineering-inaugural-collection)

This is a very exciting collection of the first papers published in CDIE that look at functional surfaces and interfaces. This collection 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 (<https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2024.1401391/full>) 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, (<https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2024.1417527/full>) spanning from processing techniques to mechanical behaviours under extreme conditions. <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2025.1539792/full>.

Another review article focuses on electric vehicles (EVs), <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2024.1426164/full> 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, <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2023.1278575/full>. The presented work could potentially lead to alternatives to hard chrome, which is environmentally unfriendly and unsafe

The collection 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 <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2024.1379005/full>. 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, <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2024.1428841/full>. 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, <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2025.1539792/full>. 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. Roques-Carmes and colleagues <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2024.1422260/full> 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. Cerda and Avila <https://www.frontiersin.org/journals/coatings-dyes-and-interface-engineering/articles/10.3389/frcdi.2025.1527060/full> 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.

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