Combined ACT & VIC-TAS Branch Seminar

Enhancing the longevity of steel structures using recycled Al alloy coatings via multiscale modelling

Hybrid (Online and In-Person at RMIT University)

6 March 2025

REGISTER HERE

3:30 PM - 4:30 PM AEDT

Join us in person or online for an exciting seminar where we will present the innovative advancements of the European project ALCOAT. Learn about the physically informed multiscale simulation model developed by the teams of Prof. Ivan Cole (RMIT, ANU) and Prof. Pablo Ordejón (ICN2) for creating advanced recycled sacrificial coatings.

- **Date:** Thursday 6 March 2025
- **Time:** 3:30-4:30 PM Melbourne time (AEDT / UTC+11)
- **Location:** AMP meeting room, Building 55, Level 3, Rooms 4-5, RMIT Melbourne City Campus

Click the red box to register and receive a link to join the session online.

Feel free to forward this email to colleagues who may be interested. If you can't attend but would like to know more, contact Dr. Stefano Piccardo at stefano.piccardo@rmit.edu.au

Speakers

Stefano Piccardo
Postdoctoral Fellow (ALCOAT Project)
Royal Melbourne Institute of Technology Spain S.L

Keshava Boorgula
PhD Candidate, Electrochemical Modelling
Royal Melbourne Institute of Technology Spain S.L

Enhancing the longevity of steel structures using recycled Al alloy coatings via multiscale modelling

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Abstract

We are delighted to share our first results from the European multidisciplinary research project "ALCOAT," which aims to transform steel corrosion prevention using scrap aluminium (s-Al) coatings within a circular economy approach. This research promises numerous potential benefits, including a 60-70% reduction in coating mass, up to 75% cost savings, and significantly lower environmental impacts compared to standard zinc coatings, potentially saving 11.7 megatons of CO2 equivalent annually. While the composition of s-Al varies rendering it problematic for many applications, these impurities may actually enhance its anti-corrosive performance. Our objective is to thoroughly evaluate and identify optimal s-Al compositions by testing under field-like atmospheric conditions. As a key part of the ALCOAT project, we are developing a physically informed multiscale simulation model. This model integrates molecular-scale insights gained through density functional theory (DFT) with continuum-scale finite element simulations, validated against experimental data. Our approach indicates the significant role of trace metals in disrupting the protective oxide layer in localized areas, thereby reducing the passivation of sacrificial coatings, while ensuring a low corrosion rate, and minimising the risk of hydrogen embrittlement. Applications of this research can improve corrosion protection of both exposed structures (wind turbines, ships, etc.) and steel sheet (automotive panels, building facades, and home appliances).

Dr. Stefano Piccardo is a postdoctoral researcher at RMIT Europe (Spain) and holds a double PhD in applied mathematics and computational science from the École Nationale des Ponts et Chaussées (France) and the Universitat Politècnica de Catalunya (Spain). His research focuses on high-fidelity finite element methods for bridging the theory-practice gap in fluid mechanics, fracture mechanics, and electrochemical applications.

Keshava Boorgula is a PhD candidate in a cotutelle program between RMIT University and ICN2 (Spain), specialising in corrosion engineering and modelling. He completed his master's degree in metallurgy at the Indian Institute of Engineering Science & Technology, Shibpur in 2022.