Exploring the potential of nanotechnology approaches to tackle biofouling and corrosion in marine environment

Study on bifunctional nanozyme activities of layered double hydroxide derived Zn-Mo films for anti-biofouling and anti-corrosion applications at the subsea environment

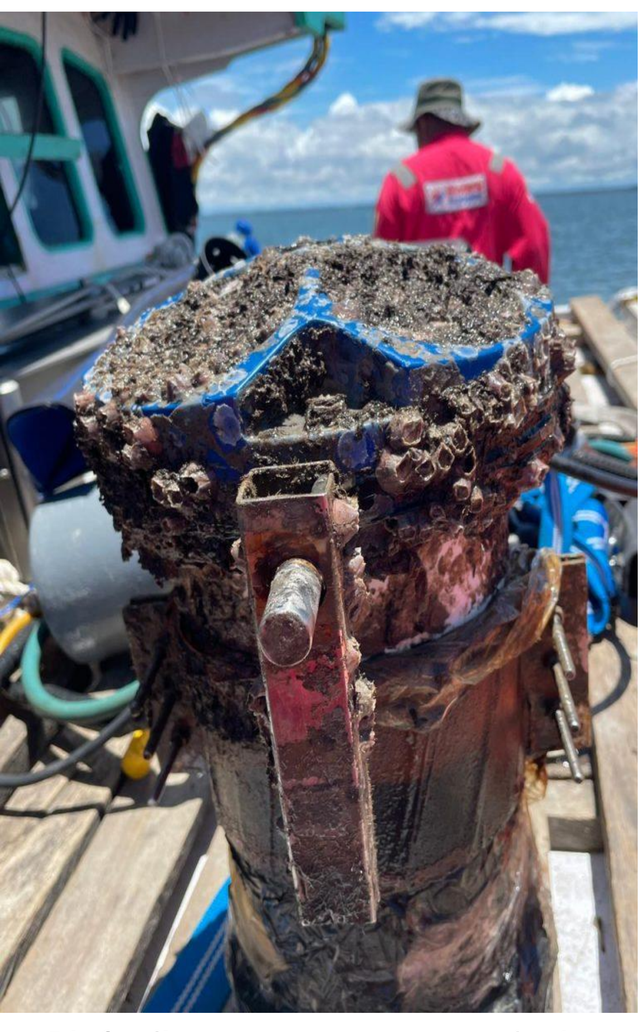
Paul Thomas
paul.thomas@uib.no
Department of Physics and Technology
SFI Smart Ocean

Background and motivation

What most fascinates me about research is how it empowers individuals to devise their own challenges and then work to overcome them. I earned a Master's degree in Energy and Environment from VIT University in India, and the passion I cultivated during those studies motivated me to pursue a doctoral program at the Nanotechnology & Catalysis Research Centre at the University of Malaya in Malaysia. My doctoral research concentrated on designing ternary nanometal oxide composites for energy and environmental applications. My desire to enhance my knowledge and develop solutions to the challenges facing marine ecosystems has led me to seek a position as a researcher in the SEAS program, where I can leverage nanotechnology to address these critical issues.

Project description

Many conventional antifouling and corrosive agents that can harm the environment are being phased out. My current project focuses on a novel synthesized Zn-Mo mixed metal oxide layered double hydroxide that could eliminate the need for toxic chemicals in paints and other products. Extensive investigations will be conducted to comprehensively examine the broad range and magnitude of its photocatalytic capabilities, with the aim of enhancing its capacity to inhibit biofouling and corrosion across a wide variety of surfaces and diverse applications.



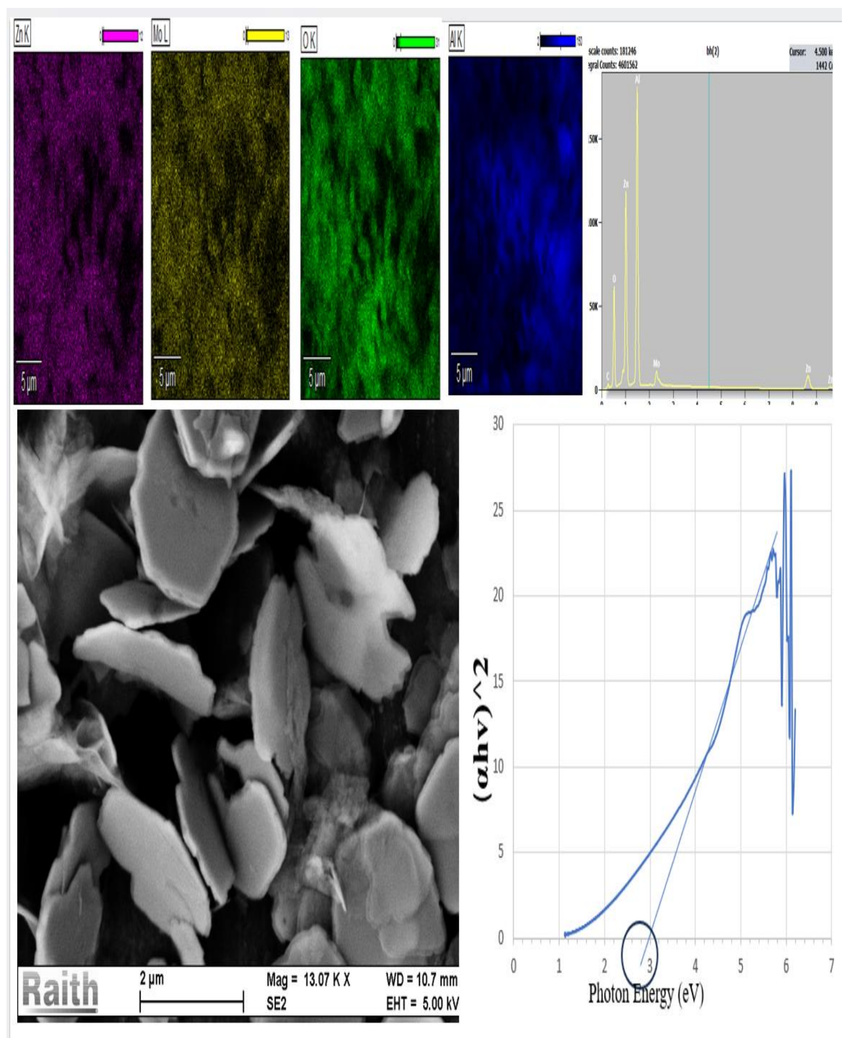
Biofouling on measurement devices

Aims (and/or milestones)

- To design Zn-Mo LDH nano metal oxide coating for multifunctional applications.
- To optimize the physiochemical characteristics for better protection against biofouling and corrosion.
- Study on stability evaluation for longer periods at laboratory and sub-sea environment.

Main questions

- How effective the nanocoating protection against biofouling and corrosion agents at subsea environment?.
- Can it use as replacement of toxic chemicals in paints or additives?
- Durablity and toxicity assessment for long periods?.



Electron microscopy images and bandgap assessment

Highlighted results (and/or activities)

Publication

Thomas P, Sahoo BN, Thomas PJ, Greve MM. Recent advances in emerging integrated anticorrosion and antifouling nanomaterial-based coating solutions. Environmental Science and Pollution Research 2024 2024:1–27. https://doi.org/10.1007/S11356-024-33825-6.

Discussion with Xylem/Aanderaa Data Instruments AS

Marine sustainability

Biofouling and corrosion are causing the deterioration of our oceans, industrial heavy machinery, sensitive equipment, microobjects, and other materials. This gradual toxicity affects all submerged and semi-submerged surfaces, particularly impacting marine aquatic organisms. As a result, minimizing the effects of biofouling and corrosion is crucial for maintaining marine sustainability.

Supervisory team

- **Main Supervisor-** Dr. Martin M. Greve, Department of Physics and Technology, University of Bergen
- **Co-Supervisor**- Dr. Peter James Thomas, Chief Scientist,NORCE

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