Multifunctional Coating

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

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Background and motivation

The aspect of research that fascinates me the most is how it enables individuals to create their own set of challenges and then seek to solve them. I have Master's degree in Energy and Environment from VIT University, India. The passion I discovered during my masters inspired me to join the doctorate program at Nanotechnology & Catalysis Research Centre (NANOCAT) University of Malaya, Malaysia. My doctorate studies focused on designing ternary nanometal oxide composite for energy and environmental applications. My interest in joining the SEAS program as a researcher stems from my desire to enhance my knowledge and to develop solutions to the challenges faced by marine ecosystem. It's possible that nanocoating, when used for several purposes, could be a more cost-effective and secure alternative.

Project description

Marine biofouling and corrosion are costly and require sophisticated chemical or physical techniques. However, most of the present antifouling and corrosive substances that might harm the environment via metal leaching and bacterial resistance are being ceased. Metal oxides like zinc and molybdenum have excellent photocatalytic properties that further aid in nanozyme activity and prevent the growth of bacteria and other fouling and corrosive agents. We propose the novel synthesis of stable Zn-Mo mixed metal oxide by layered double in-situ hydrothermal route. This environmentally friendly approach offers fresh perspectives for creating anti-corrosive and anti-biofouling coatings for metals used in maritime environments. It is anticipated that this effort will provide fresh perspectives for metal-based LDH's future development and broaden its scope of applicability for corrosion and anti-biofouling coatings.

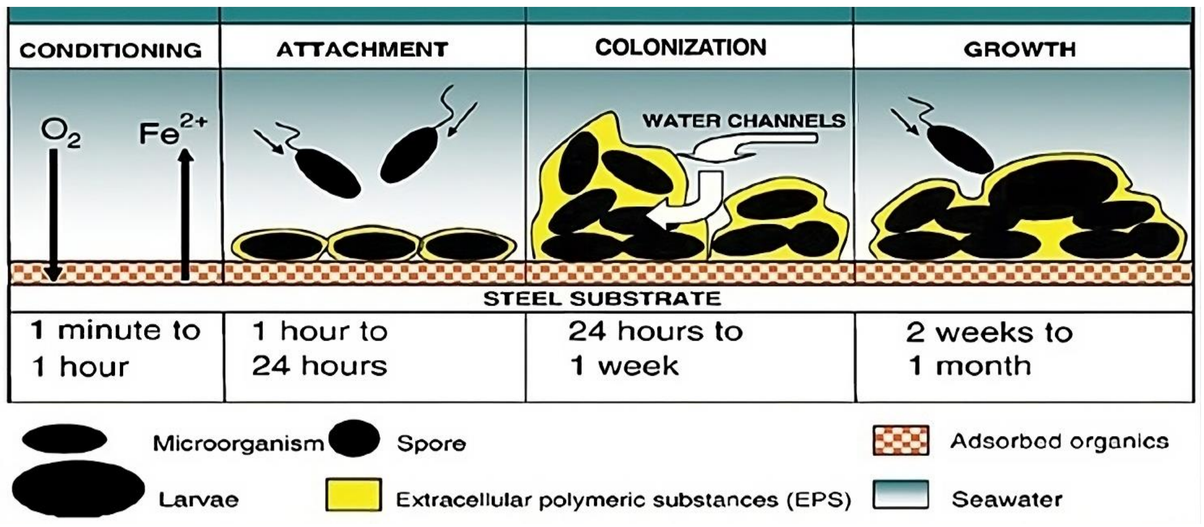
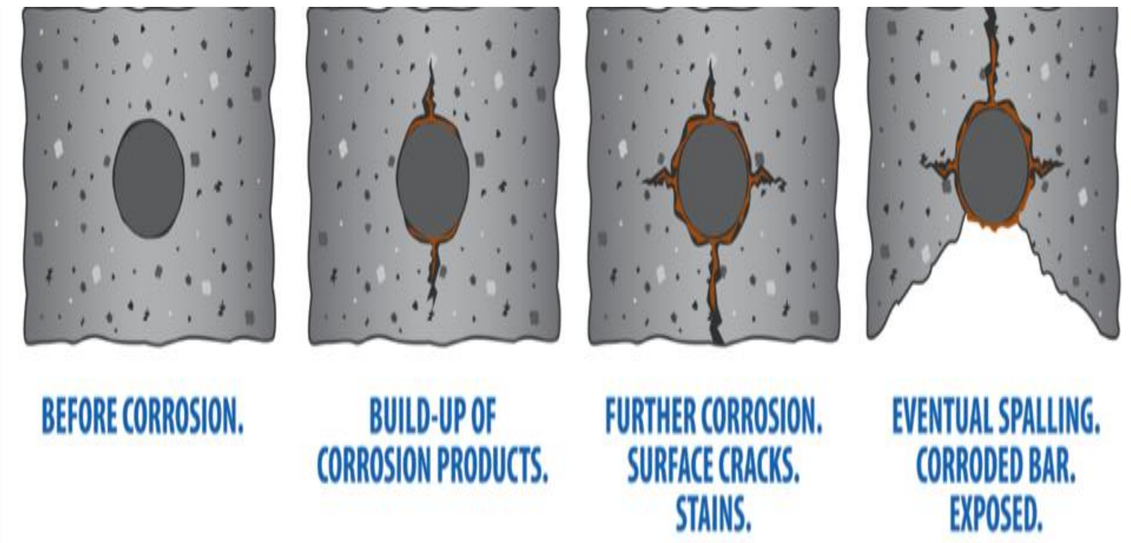


Diagram of biofouling stages.



Corrosion cycle of steel.

Main questions

- How effective the nanocoating protection against biofouling and corrosion agents at subsea environment?.
- How the nano layered double hydroxide based nanocoating enhance the physiochemical and antifouling characteristics?.
- How to achieve better stability in performance for longer periods?.

Marine sustainability

Our oceans, industrial heavy machinery, sensitive equipment, microobjects, and other materials are deteriorating due to biofouling and corrosion. On all submerged and semisubmerged surfaces, it exerts a gradual toxicity, particularly towards marine aquatic organisms. Due to this, minimizing the effects of biofouling and corrosion is crucial for the marine sustainability.

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 agent.
- Study on stability evaluation for longer periods at sub-sea environment.

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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