2022-09-15

Synthesis of nanostructured metal-organic frameworks (MOFs) for antifouling applications

Master project/internship/thesis with a duration of 6 months

Location: Division of Chemistry and Biochemistry, Department of Chemistry and Chemical Engineering, Chalmers University of Technology

Supervisors: Dr. Zhejian Cao and Dr. Francoise Mystere Noa

Examiner: Prof. Lars Öhrström

Time to start: As soon as possible

Background: Biofouling is a long-time challenge in the marine industry where unwanted microorganisms attach to ship hulls and increase corrosion, drag, and fuel consumption. A successful solution to marine biofouling is estimated to be able to reduce greenhouse gas emissions from maritime transport by 75%, translating to a reduction of 600 megatons of carbon dioxide (CO_2) emitted per year[1]. Therefore, a technology that could offer sustainable, effective, and long-term protection of surfaces against biofouling is needed and can ultimately contribute to a sustainable aquatic ecosystem and carbon-neutral environment. Metal-organic frameworks (MOFs) are crystalline porous materials with designable geometries, e.g., via various synthesis conditions[2]. By functionalizing the organic linkers, the antibacterial performance of the MOFs can be modified. To achieve long-term protection, integrating biodegradable polymers with MOF can be a promising solution. This project is an interdisciplinary work, offering experience in chemistry, materials science, and biology.

The aim of the project: This project will be carried out in Chalmers Crystal Engineering Research lab. Different MOFs will be synthesized, functionalized, and characterized. The stability of the biodegradable polymer-MOF composite will be evaluated.

What will you do/learn?

- Synthesis of MOFs with certain geometries and functionalities
- Selection of biodegradable polymers
- Materials characterization, including scanning electron microscopy (SEM), Transmission electron microscope (TEM), X-ray diffraction (XRD), BET surface analysis, etc.

About you

- Enrolled in a master program relevant to chemistry or materials science
- Enjoy science and learning new things with strong motivation
- Good at teamwork and collaboration

How to apply?

Please send an application email to zhejian@chalmers.se with your CV

More information:
https://www.chalmers.se/en/departments/chem/research/chembiochem/ResearchGroups/ohrstromsResearchGroup/Pages/default.aspx; www.jerrylab.com;

[1] Bouman, et al. Part Transp. Environ. 52, 408–421 (2017).

[2] Öhrström, L. & Amombo Noa, F. M. Metal-Organic Frameworks. DOI: 10.1021/acs.infocus.7e4004.