Research Project Details for Graduate Research Assistant (GRA) Recruitment

Research Project Title

Sustainable Functional Catalytic Nano-Coatings

Programme Name

Master in Chemical Engineering/Master in New Energy Science and Engineering

Details of Primary Supervisor

1. Name: Lai Sin Yuan
2. Department and University: Chemistry, Xiamen University Malaysia
3. Email address: sinyuan.lai@xmu.edu.my
4. Research interests: Heterogeneous catalysis, nanomaterials, green chemistry, materials science, photocatalysis, biomass, biofuels, biopolymer, machine learning

Details of Research Project

1. Duration: 2 years
2. Summary:

Sustainable Functional Catalytic Nano-Coatings

Development of bio-based nano-coatings for recycled paper and packaging applications to achieve high barrier performance while maintaining biodegradability, offering alternatives to petroleum-based plastics.

3. Skills/techniques development:

Materials Synthesis & Fabrication

- Bio-based polymer formulation and modification
- Nano-coating preparation (solution casting, dip coating, spray coating)
- Nanoparticle synthesis from biomass/agro-waste
- Catalyst preparation (calcination, impregnation, surface functionalization)

Materials Characterization

- Morphological analysis (SEM)
- Structural and crystallinity analysis (XRD)
- Functional group analysis (FTIR)
- Surface chemistry and wettability (contact angle measurement)
- Thermal analysis (TGA/DSC)
- Mechanical and barrier property testing (WVTR, OTR)

Catalysis & Environmental Applications

- Design and operation of Advanced Oxidation Processes (AOPs)
- Photocatalytic and heterogeneous catalytic testing
- Kinetic modeling and degradation efficiency analysis
- Wastewater quality analysis (COD, TOC, UV-Vis spectroscopy)

Data Analysis & Research Skills

- Experimental design and optimization
- Scientific writing and journal publication
- Grant proposal exposure
- Conference presentation skills

Sustainability & Circular Economy Knowledge

- Waste-to-wealth material valorization
- Life-cycle thinking in materials development
- Biodegradable and compostable material design principles

4. Location: XMUM

GRA Requirements:

Number of Master places available: 1

1. Bachelor's degree in Chemical Engineering, Materials Science, Chemistry, Environmental Engineering, New Energy Science, or related disciplines, with CGPA $\geqslant$ 3.50
2. Good command in written and oral English
3. Strong interest in sustainable materials and environmental technologies
4. Ability to design experimental work and perform interpretation skills
5. Motivated, disciplined, and research-oriented
6. Willingness to learn new techniques
7. Ability to work both independently and in a team
8. The selected candidate must register Master programme at XMUM