

Research Project Title

Mechanism of Synergistic Effects during Microwave Co-pyrolysis of Waste Activated Sludge and Polyethylene Terephthalate for Enhanced Bio-energy Production

Details of Primary Supervisor

1. Name: Dr. Mong Guo Ren
2. Department and University: Department of New Energy Science and Engineering, Xiamen University Malaysia
3. Email address: guoren.mong@xmu.edu.my
4. Research interests: Bioenergy, pyrolysis, waste valorization

Details of Research Project

1. Duration: 2 years

2. Summary:

Global trash output is expanding at an alarming rate, putting further strain on waste management systems that are already overburdened. Malaysia's industrial production is expected to grow at a 3% annual rate, resulting in increased industrial waste generation. Plastic garbage is the most common non-biodegradable waste component (25.9 %) in Malaysian Commercial and Institutional (ICI) waste. This study intends to evaluate the potential of microwave co-pyrolysis in waste-to-energy applications in accordance with the 12th Malaysia Plan(RMK-12), which aspires to achieve a 40% recycling rate and a 31% Renewable Energy (RE) target of total installed capacity by 2025. Waste activated sludge (WAS) from an industrial wastewater treatment plant and Polyethylene Terephthalate (PET), a single-use plastic waste, will be investigated. Pyrolysis has been viewed as a technology capable of valorizing waste into higher value products for bioenergy recovery. One major disadvantage would be the less desirable properties of end-products, which would limit direct use. Co-pyrolysis, which involves blending diverse feedstocks, appears to be a solution to the aforementioned difficulty; however, different feedstocks will have distinct reaction mechanisms, while the blending of WAS and PET have not been explored before. Therefore, the proposal aims to investigate the reaction mechanism, kinetics, and thermodynamics of co-pyrolysis, which are significant metrics in assessing waste conversion pathways. A lab-scale microwave pyrolysis reactor will be built to analyse end-products and assess potential synergism. Microwave heating is chosen because its radiative heating process eliminates uneven heating and provides greater heat gradient within the feedstock. Finally, the bioenergy distribution pathway of the feedstock blend will be investigated to assess microwave pyrolysis' waste-to-energy potential for WAS and PET wastes. With this

research, insight about how waste conversion technology can generate bio-energy, specifically on how to co-pyrolyze two of the most prevalent wastes – WAS and PET will be shown.

3. Skills/techniques development:

Hands-on Experimental skills; Data processing and analysis; Problem identification and solving.

4. Location: Xiamen University Malaysia, Sepang, Selangor.

GRA Requirements

Number of Master places available: 2

1. The candidate must be enrolled in XMUM Master programme
2. Proactive, independent, self-motivated, exceptional interpersonal and problem-solving skills
3. Have experience/interest in experimental work (hands-on is required in this project)
4. Good command of English (written & oral)



XIAMEN UNIVERSITY MALAYSIA
廈門大學 馬來西亞分校



Postgraduate Opportunity (Master)

Position: Graduate Research Assistant

Program Information:

<https://www.xmu.edu.my/2020/1208/c16271a423540/page.htm>



Research Project

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(Funded by FRGS, Ministry of Higher Education, Malaysia)

Requirement

- Malaysian
- BEng/BSc degree in related discipline (Chemical / Mechanical / Materials / Engineering / Science equivalent)
- Proactive, independent, self-motivated, exceptional interpersonal and problem-solving skills
- Have experience/interest in experimental work (hands-on is required in this project)
- Good command of English (written & oral)
- GCPA > 3.0
- Starts October/November 2022

Remuneration

Monthly allowance for up to 2 years for a full-time Master's candidate

*Scholarship available for Full tuition fees waiver worth up to RM 50,000

Commencement Date

Immediate Position

Interested Applicant

*** Terms & Conditions Applied**

Send your CV to guoren.mong@xmu.edu.my

