



PhD Studentship: Direct chemical conversion of mixed biomass residue into biodegradable polymers

University	Technological University of the Shannon: Midlands Midwest
University School	Faculty of Engineering
Project Title	Direct chemical conversion of mixed biomass residue into biodegradable polymers
Post Duration	4 years
Supervisors/ Mentors	Dr Yuanyuan Chen, Dr Yong Tang, Prof Maurice Collins
Main Location for project	Technological University of the Shannon: Midlands Midwest
Funding source	BiOrbic
Provisional start date	1 st Oct 2024
BiOrbic Challenge	Climate Neutral Forestry
Salary	€22,000 stipend per year, material and travel budget of €28,000 for 4 years

Background

Typically, industrial biomass residues, such as brewers' grain, are preferred for their purity and homogeneity. Conversely, mixed biomass, such as agricultural and forestry residues, despite their rich carbon content and abundant availability, are usually not converted due to their heterogeneity, which complicates the conversion process. In addition, the current process of converting biomass into biopolymers involves complex steps to separate target components like cellulose and lignin, followed by chemical conversion, often leading to partial biomass valorisation. This underutilization underscores the need for improved methods to effectively handle diverse biomass sources.

Objectives

This project aims to convert mixed biomass and biomass components into novel biopolymers, followed by comprehensive characterisation. It also seeks to understand the reaction mechanisms via molecular modelling.

Methodology

The PhD candidate will begin with a literature review on the direct esterification of biomass and conduct laboratory experiments. Then the candidate will travel and spend 12-24 months at Huanghuai University in China to gain hands-on experience in molecular modelling under the supervision of Dr Yong Tang. Finally, based on the modelling results, optimized solvents and reaction conditions will be selected and verified through laboratory experiments. The PhD candidate will develop expertise in polymer synthesis and characterization using advanced laboratory equipment, and receive structured training modules and specific training in molecular modelling to understand the kinetics and mechanisms of the chemical reaction involved.

Requirements

Applicant should have, or expect to achieve (prior to the project start), at least a 2:1 honours degree (or equivalent) in polymer chemistry. Experience and a strong interest in bio-based polymers is



desirable. Applicants for whom English is a second language will be required to meet English language requirements, e. g. IELTS [International English Testing System] Applicants must have a minimum of 6.0 or Duolingo English Test score of 110. Applicant must have the ability to travel.

Position Details

The successful candidate will be enrolled in the PhD Programme in the Faculty of Engineering at the Technological University of the Shannon: Midlands Midwest. The scholarship includes tuition fees, a €22,000 annual stipend, travel, and consumable budget. The project will be mainly supervised by Dr Yuanyuan Chen at the Technological University of the Shannon in Ireland, who is a research fellow and specialises in bio-based biodegradable polymer development. The project will be co-supervised by Prof. Maurice Collins at the University of Limerick in Ireland and Dr Yong Tang at Huanghuai University in China. The length of the project is 4 years and aims to start from 1st Oct 2024.

Application Procedure

Applicants should email Dr Yuanyuan Chen (Yuanyuan.chen@tus.ie) with a curriculum vitae (CV) and a short cover letter detailing their motivation for applying for the position. Academic references should also be provided. Deadline for application: 31st Aug 2024.

BiOrbic

This project is funded by BiOrbic, Ireland's National Bioeconomy Research Centre. BiOrbic is a national collaboration of researchers, focused on the development of a sustainable, circular economy. Encompassing 100+ researchers from twelve institutions in Ireland, along with International collaborators, BiOrbic is focused on training and developing the next generation of Bioeconomy leaders.