Technological University of the Shannon:
Midlands Midwest

Ollscoil Teicneolaíochta na Sionainne:
Lár Tíre Iarthar Láir

PhD advert

Direct chemical conversion of the mixed biomass residue into biodegradable polymers

Background: The current process of converting biomass into biopolymers involves complex steps to separate components like cellulose and lignin, followed by chemical conversion, often leading to partial biomass valorisation. 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. 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.

Applicant profile: 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: This project is funded by the Bioeconomy Science Foundation Ireland Research Centre (BiOrbic). 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.

Application Process: 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: Until an appropriate candidate is found