



**Research Centre**

**Post title**

**Level on Framework**

**Post duration**

School of Biotechnology

Postdoctoral Researcher in

Bioprocess Engineering

Level 1

11-Month Fixed Term Contract

### **Dublin City University**

Dublin City University (DCU) is a leading innovative European University. It is proud to be one of the world's leading Young Universities and is among the world's top 2% globally. DCU is known as Ireland's University of Impact, with a mission to 'transform lives and societies' and focuses on addressing global challenges in collaboration with key national and international partners and stakeholders.

DCU has over 20,000 students in five faculties spread across three academic campuses in the Glasnevin-Drumcondra area of North Dublin. Thanks to its innovative approach to teaching and learning, the University offers a 'transformative student experience' that helps to develop highly sought-after graduates. DCU is currently No. 1 in Ireland for Graduate Employment Rate, and for graduate income (CSO).

DCU is a research-intensive University and is home to a number of SFI-funded Research Centres. The University participates in a range of European and international research partnerships. DCU is also the leading Irish university in the area of technology transfer as reflected by licensing of intellectual property.

As a 'People First' institution, DCU is committed to Equality, Diversity and Inclusion - a University that helps staff and students to thrive. The University is a leader in terms of its work to increase access to education, and is placed in the world's Top 10 for reducing inequalities in the Times Higher Education Impact Rankings.

### **Research Career Framework**

As part of this role the researcher will be required to participate in the DCU Research Career Framework. This framework is designed to provide significant professional development opportunities to Researchers and offer the best opportunities in terms of a wider career path.

## Background & Role

The School of Biotechnology at Dublin City University invites applications for a postdoctoral researcher role in Bioprocess Engineering to work on a Sustainable Energy Authority Ireland (SEAI) funded project titled Dark Fermentation and Hydrogen Generation. The position is available from October 2023, for 11-months.

This project involves a high level of industry engagement particularly with Irish Whiskey Distillery and Dairy industries in forms of sample collection and research meetings on a regular basis. In the process of dark fermentation, complex organic matter is broken down to their monomer at hydrolysis step, to be further converted to volatile fatty acids in acetogenesis step. The anaerobic microbes, namely *Enterobacter* spp., *Clostridium* spp., *Bacillus* spp. or *Ruminococcus* spp. are then ferments the intermediate substrates into biohydrogen in the absence of light at ambient temperature. It's considered to be the most advantageous sustainable energy production process as the 3-fold higher calorific value of biohydrogen (142 MJ/kg) in comparison to biomethane (50 – 55 MJ/kg). Owing to its high energy value, biohydrogen has an indicative price range of €0.9 – 7.3 per kg while it is only €0.4 – 0.7 per kg for biomethane. Moreover, the current biohydrogen global market size is €124.4 billion with an estimation to reach €183.4 billion by 2025 while the estimated market size for biomethane is only €2.4 billion. The financial potential and the clean nature of biohydrogen renders it a “fuel of the future”.

This project aims to develop economic solutions for widespread adoption of dark fermentation using pot ale, draff and cheese whey and dairy wastewater from Irish whiskey and dairy industries for biohydrogen production. In this regard the project aims to create a comprehensive overview by maximising the biohydrogen yield of the forementioned substrates, to guiding the full-scale applications in terms of energy recovery and environmental standpoints in transitioning to a low carbon economy. The ultimate goal of this project is to initiate an economically viable future best practise by

- (i) optimising biodegradation efficiency of the wastes and microbial activity of inoculum will be enhanced by novel pre-treatments,
- (ii) modelling and optimising the operational parameters via Design Expert Software prior to scale up
- (iii) assessing techno-economic analysis and environmental benefits of potential future industrial dark fermentation pathways

The project will be supervised by Assistant Professor Dr. Brian Freeland in Bioprocess Engineering in the School of Biotechnology, Dublin City University.

## **Principal Duties and Responsibilities**

Reporting to their Principal Investigator the Postdoctoral Researcher will:

- Conduct a specified programme of research on Dark Fermentation and Hydrogen Generation under the supervision and direction of the Principal Investigator
- Liaise with both internal and external stakeholders including industry and academic partners/collaborators
- Engage in the dissemination of the results of the research in which he/she is engaged with the support of and under the supervision of the Principal Investigator, with a specific focus on completing funding reports and preparing presentations and material for funding reviews
- Supervise and assist undergraduate and postgraduate students working in this area with their research
- Carry out administrative work associated with the programme of research as necessary, including supporting the Principal Investigator in tendering for equipment and instruments required for the project

## **Minimum Criteria**

- PhD in Bioprocess Engineering, Chemical Engineering, Biotechnology, Microbiology or with relevant experience and an understanding of the “biomass to bioenergy” conversion technologies.
- Is highly motivated and passionate about sustainability and climate change research

## **Desirable Criteria**

- Has evidence of strong technical skills in handling single and/or mixed bacterial cultures, microbial fermentation, process design and scale-up as evidenced by peer reviewed original and review publications.
- Demonstrates a track record of strong research experience in the development and application of analytical assays for characterisation of the organic wastes (substrate) as well as quantitative analysis of hydrogen.
- Has experience in process techno-economic evaluation and/or lifecycle assessment.
- Has a significant publication record of relevance to the project, excellent data analysis, communication and organisational skills.
- Demonstrates experience of statistical software for mathematical modelling and process optimisation

**Candidates will be assessed on the following competencies:**

**Discipline knowledge and Research skills** – Demonstrates knowledge of a research discipline and the ability to conduct a specific programme of research within that discipline

**Understanding the Research Environment** – Demonstrates an awareness of the research environment (for example funding bodies) and the ability to contribute to grant applications

**Communicating Research** – Demonstrates the ability to communicate their research with their peers and the wider research community (for example presenting at conferences and publishing research in relevant journals) and the potential to teach and tutor students

**Managing & Leadership skills** - Demonstrates the potential to manage a research project including the supervision of undergraduate students