



## JOB DESCRIPTION

<b>Research Centre</b>	School of Biotechnology
<b>Post title</b>	Postdoctoral Researcher in Bioprocess Engineering
<b>Level on Framework</b>	Level 1
<b>Post duration</b>	11-month fixed-term contract (with the possibility of extension)

### **Dublin City University**

Dublin City University (DCU) is a young, ambitious and vibrant university, with a mission 'to transform lives and societies through education, research, innovation and engagement'. Known as Ireland's 'University of Enterprise', DCU is a values-based institution, committed to the delivery of impact for the public good. DCU was named Sunday Times Irish University of the Year 2021.

DCU is based on three academic campuses in the Glasnevin-Drumcondra region of north Dublin. More than 18,000 students are enrolled across five faculties – Science and Health, DCU Business School, Computing and Engineering, Humanities and Social Sciences and DCU Institute of Education.

DCU is committed to excellence across all its activities. This is demonstrated by its world-class research initiatives, its cutting-edge approach to teaching and learning, its focus on delivering a transformative student experience, and its positive social and economic impact. The university continues to develop innovative programmes in collaboration with industry, such as the DCU Futures suite of degrees, which are designed to equip graduates with the skills and knowledge required in a rapidly evolving economy.

DCU's pursuit of excellence has led to its current ranking among the top 2% of universities globally. It is also one of the world's Top Young Universities (QS Top 100 Under 50, Times Higher Top 150 Under 100). In the Times Higher Education University Impact Rankings 2021, DCU ranked 23rd in the world for its approach to widening participation in higher education and its ongoing commitment to eradicating poverty, while it ranks 38th globally for its work in reducing inequality and 89th globally for gender equality.

The university is ranked 23rd in the world and first in Ireland for its graduate employment rate, according to the 2020 QS Graduate Employability Rankings. Over the past decade, DCU has been the leading Irish university in the area of technology transfer, as reflected by licensing of intellectual property.

## **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 March 2023, for 11-months with a possible extension.

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 his/her Principal Investigator the successful individual 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 assisting the Principal Investigator in tendering for equipment and instruments required for the project

**Minimum Criteria**

- PhD in Bioprocess Engineering, Chemical Engineering, Biotechnology, Microbiology 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

**Essential Training**

The postholder will be required to undertake the following essential compliance training: Orientation, Health & Safety and Data Protection (GDPR). Other training may need to be undertaken when required.