Research Centre Fraunhofer Project Centre at Dublin City University (FPC@DCU) APT Centre and I-FORM

Post Title Postdoctoral Researcher – Advanced manufacturing towards protein digestion applications (Two Posts)

Level on Framework Level 1

Post Duration Fixed Term Contract up to 2 Years Duration

Overview

Dublin City University www.DCU.ie 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 and Transformation', it is committed to the development of talent, and the discovery and translation of knowledge that advances society and the economy. DCU is the Sunday Times Irish University of the Year 2021.

The University is based on three academic campuses in the Glasnevin-Drumcondra region of north Dublin. It currently has more than 18,000 students 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 creating a transformative student experience, and its positive social and economic impact. This exceptional commitment on the part of its staff and students has led to DCU's ranking among the top 2% of universities globally. It also consistently features in the world's Top 100 Young Universities (currently in QS Top 70 Under 50, Times Higher Top 150 Under 100).

DCU is placed 84th in the world, in the Times Higher Education University Impact Rankings – measuring higher education institutions' contributions towards the UN Sustainable Development Goals. Over the past decade, DCU has also been the leading Irish university in the area of technology transfer, as reflected by licensing of intellectual property.

As part of this role the researcher will be required to participate in the DCU 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. The role may include teaching duties to assist with module delivery.

Fraunhofer Project Centre at Dublin City University (FPC@DCU)
Microfluidics Ireland (https://www.microfluidicsireland.com/) or the Fraunhofer Project Centre for embedded bioanalytical systems (FPC@DCU) is a three-way partnership between Science Foundation Ireland (SFI), the Fraunhofer Institute for Production Technology (Aachen, Germany), and Dublin City University. The Fraunhofer Gesellschaft is Europe's largest organization for applied research, with more than 25,000 employees and 75 specialised Institutes across Germany.

FPC@DCU cutting edge research to develop microfluidic technologies for application in biomedical diagnostics and in distributed testing. Previous projects have included research in the areas of HIV diagnostics for developing countries, early diagnosis of bacterial meningitis, water quality testing, and identification of plant pathogens in the field to reduce pesticide use. FPC@DCU is commercially focussed and offers to partner with companies to de-risk and accelerate early-stage technologies for commercialisation. Through its partnership with the Fraunhofer Institute for Production Technology (IPT) in Aachen, Germany, coupled with indigenous collaborating manufacturing partners, FPC@DCU also offers manufacturing scale-up capabilities, with access to cutting edge small scale manufacturing, microfluidic injection moulding and automated assembly/bonding systems.

APT Centre and I-FORM: The Advanced Processing Technology Research Centre (APT) (http://aptcentre.ie/) focuses on state of the art research activities in the areas of Production Technology, Product Design & Sustainability, Micro and Nano Systems Technology, Advanced Materials Engineering and Bio Systems. The APT is a leading international research centre which as a primary goal strives to provide significant translational benefit to the wider community. Research projects undertaken within APT are conducted to a world class level and support local and internationally based enterprises. The APT research group has established a strong infrastructure of equipment and people in the area of processing technologies at DCU. APTs education and outreach events include seminars and courses which enable the transfer of processing technologies knowledge to the broader community. Also hosted within APT is the Irish hub of the EPSRC/SFI Funded Center for Doctoral Training in Advanced Metallic Systems (http://www.metallicscdt.co.uk/).

I-FORM (http://www.i-form.ie/) is the SFI Research Centre for Advanced Manufacturing and its mission is to shape the future of manufacturing through high-impact research into the application of digital technologies to materials processing.

Role Profile

FPC@DCU and APT/I-Form are jointly seeking to recruit a two-year project to develop advanced manufacturing technologies to develop highly sensitive flow-based electrochemical sensor systems. The successful applicant will work across both centres to develop integrated microfluidic devices to apply this process to diagnostic applications. 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.

Duties and Responsibilities

- The successful candidate will work and report to the Principal Investigators noted below and others within the research team, in FPC and APT/I-Form at DCU.

- The Researcher will develop, implement, and characterise advanced manufacturing techniques (laser machining and structuring, metallic and polymer 3D printing etc) to create micro- or nano-porous,

high-surface area metallic structures (micro-pillars, highly-packed bore-holes amongst others) within flow channels.

- The 3D printing of sensors from metallic such as gold or tungsten is of particular interest. These structures will serve as enzyme reaction beds offering rapid mass transfer to yield very high reaction rates, and enhanced sensitivity of detection for bio-markers. The metallic structures will simultaneously provide electrochemical sensing of enzyme reactions that produce redox active reagents. Enzymatic reaction with biomarkers on an electrode surface is a common sample analysis procedure, but mass transport limitations commonly limit the sensitivity of these systems. Integration of porous-medium electrochemical sensors in a flow stream within microfluidic devices offers considerably enhanced sensitivity. However, porous electrode fabrication within a microfluidic structure remains a significant bottleneck in device realization, and a barrier for commercialisation of these microfluidic technologies.

- The successful applicant, working across both centres:

- Will develop this manufacturing technique, integrate it into a microfluidic device, and demonstrate / benchmark its efficacy against standard bio-analytical techniques which reply on planar electrode systems.

- The project will start with a demonstration of cholesterol analysis, utilizing two different catalytic enzyme pathways; cholesterol oxidase which produces, H_2O_2 for electrochemical detection, and cholesterol dehydrogenase, which requires a further enzyme cascade to convert the NADH produced into an electrochemical signature.

Qualifications and Experience

Minimum criteria
The successful candidate will have a Primary PhD related to Engineering or Science disciplines with a focus on bio-medical, chemical detection or cognate field.

In addition to the above it is desirable that the candidate possess a subset of the following skills.

- Ability to demonstrate a sound comprehension of the principles underpinning the theory and practice of advanced manufacturing evaluation, design of experiments and data analysis.
- High level competence in written and oral communication, and social skills necessary for productive collaborations
- Ability to bring initiative and imagination to independent work
- At least one year's relevant postdoctoral experience.
- An ability to design and/or implement experimental protocols in microfluidic devices.
- Expertise and know-how in design of experiments and related experimental methods (analytical chemistry, metrology, microscopy etc)
- A proven track record in good laboratory practise and record keeping
- Ability and motivation to prepare first in the world new and novel high impact publications, around the project goals.
- Ability to bring initiative and imagination to independent work.

The team is looking for high performance aspiring applicants with a desire to discovering new knowledge and to drive advances in the field of materials processing. Applicants are invited from high achieving graduates with the specific related backgrounds noted above.

Essential Training
The post holder will be required to undertake the following mandatory compliance training: Orientation, Health and Safety and Intellectual Property and Data Protection training. Other training may need to be undertaken when required.

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 convey 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.