TUS
Technological University of the Shannon:
Midlands Midwest
Ollscoil Teicneolaíochta na Sionainne:
Lár Tíre Iarthar Láir

POSTGRADUATE RESEARCH OPPORTUNITY

Project Title: InsuGuard: Transforming Insulin Vial Storage with PCM Aerogel Packaging for Accessibility and Energy Efficiency

Short Project Description

Over half a billion adults live with diabetes, a 16% increase since 2019, with 150–200 million relying on insulin therapy for their health. However, insulin needs to be kept cold to stay effective, while refrigerating insulin poses challenges, including accessibility issues and high-energy use, risking patients' health and limiting effective treatment. The project aims to develop a temperature-controlled external packaging to regulate the storage conditions of insulin vials and safeguard against degradation due to temperature increases. To aid in the fight against these complications, the project focuses on developing a protective polymer packaging that regulates the insulin vial temperature, supporting temperature stabilization within the range that insulin should be kept and preventing temperature fluctuations for prolonged shelf life and enhanced medication effectiveness. The core concept involves leveraging phase change materials (PCMs) that undergo phase transitions (like solid to liquid), absorbing heat energy when exposed to rising temperatures. This prevents insulin vial from heating up, maintaining a consistent internal package temperature for this medication. However, one of the key challenges associated with PCMs, especially in pharmaceutical packaging applications, is their potential for leakage and structural instability during phase transitions. To overcome this, we aim to fabricate PCMs within a porous insulator aerogel structure to support the material. This approach will stabilize PCMs within the porous aerogel, enhancing structural stability and thermal performance. This porous structure will be based on polymers currently used in packaging applications, which offer advantages such as thermal durability and recyclability for sustainable insulin storage solutions.

Duration of Project: 48 months

Funding Agency: TUS RISE Scholarship comprises of a monthly stipend, materials budget and postgraduate fee for the duration of the award only.

Type of Degree Offered: PhD

Minimum Qualifications/Experience Necessary/Any Other Requirements:

This project spans a broad spectrum of polymer processing and analytical techniques.

Requirements:

- A master's or bachelor's degree in Polymer Engineering, Materials Science, or related field is necessary.
- Expertise in polymers and materials (such as aerogels, phase change materials,…) and their synthesis and processing techniques (e.g., extrusion, compression moulding, sol-gel,…).
- Experience and knowledge with modelling software such as MATLAB for thermal modelling.
- Knowledge and experience in materials/polymers characterization techniques (e.g., DSC, FTIR, SEM, XRD,…)
- Writing skills for thesis, reports, and high-impact publications.
- IELTS [International English Testing System], Applicants must have a minimum of 6.0 with no component score less than 6.0
  Candidates with primary degrees in:

Rialtas na hÉireann Government of Ireland
Arna chomhchistiú ag an Aontas Eorpach Co-funded by the European Union
Tionól Réigiúnach Tuaiscirt & Iarthair Northern & Western Regional Assembly
Tionól Réigiúnach an Deiscirt Southern Regional Assembly
HEA AN tÚDARÁS um ARD-OIDEACHAS HIGHER EDUCATION AUTHORITY

TU RISE is co-financed by the Government of Ireland and the European Union through the ERDF Southern, Eastern & Midland Regional Programme 2021-27 and the Northern & Western Regional Programme 2021-27

- A master's or bachelor's degree in Materials Science, Polymer Engineering, or related field is recommended.

- Minimum classification of *2.1 honours or equivalent* from either a bachelor's (level 7.0) or master's degree program (achieving a level of 9.0)

IELTS [International English Testing System] Applicants must have a minimum of 6.0 with no component score less than 6.0.

Research Supervisors:

Lead TUS Supervisor:	Dr. Golnoosh Abdeali
Co Supervisor:	Dr. Declan Devine
Co Supervisor:	Dr. Romina Pezzoli
Co Supervisor:	Dr. Declan Colbert

For further information, please contact: Golnoosh.Abdeali@TUS.ie

Closing date for receipt of completed application form is 5pm on Tuesday, 4th June. Interviews will take place within subsequent weeks.

Download TUS RISE application form here:
https://tus.ie/rdi/research/office/funded-research/