



POSTGRADUATE RESEARCH OPPORTUNITY

Project Title: Development of Radiation-Resistant Scintillating Polymer Optical Fibres through Advanced Co-Extrusion Manufacturing for CERN Applications

Short Project Description:

Scintillating polymer optical fibres are critical components in high-energy particle detectors, converting ionising radiation into light signals that enable the tracking of subatomic particles. Future detector upgrades at CERN are expected to require hundreds of kilometres of these specialised fibres, creating significant challenges in manufacturing scalability, optical performance and radiation resistance.

This PhD project aims to develop an innovative, scalable manufacturing process for producing high-performance scintillating polymer optical fibres using advanced polymer compounding, co-extrusion and melt-drawing technologies. The research will investigate the formulation of polymeric core and cladding materials, including the incorporation of scintillating dyes and radiation-stabilising additives to improve optical performance and long-term durability.

A particular focus will be placed on developing continuous co-extrusion manufacturing processes capable of producing fibres with consistent dimensions, high optical transparency and controlled core-cladding interfaces. The research will also investigate polymer degradation under ionising radiation and evaluate strategies to improve radiation resistance through the incorporation of free-radical scavengers and other stabilisation technologies.

The successful candidate will undertake experimental research in polymer formulation, extrusion processing, materials characterisation and optical performance testing. The project will also investigate advanced scintillating dye systems, processing optimisation and manufacturing scale-up, with the ultimate objective of developing a technically viable manufacturing approach for next-generation particle detectors.

The research will be conducted within the PRISM Research Institute at Technological University of the Shannon (TUS), utilising the advanced polymer processing and characterisation facilities of the Applied Polymer Technologies (APT) Technology Gateway. The project is being developed in response to CERN/LHCb detector requirements and offers opportunities for engagement with international researchers working in advanced materials and particle detection technologies.

The outcomes will have potential applications beyond particle physics, including medical radiation detection, dosimetry, nuclear instrumentation and advanced sensing technologies.

Type of Degree Offered:

Doctor of Philosophy (PhD)

Duration of Project:

48 months (4 years), full-time.

Funding Agency:

TUS Strategic Research Fund

Funding Details: Fees/Stipend/Materials

This is a proposed funded PhD research opportunity, subject to confirmation of the funding arrangements.

The funding package is expected to support:

- Postgraduate tuition fees.
- An annual PhD student stipend of €17,000



TUS

**Technological University of the Shannon
Midlands Midwest**

Ollscoil Teicneolaíochta na Sionainne:
Lár Tíre Iarthar Láir

- Research consumables, materials and experimental testing.
- Relevant research training, conference participation and collaborative research activities, subject to available funding.
- Opportunities to visit CERN to test and validate research outputs

Minimum Qualifications/Experience Necessary/Any Other Requirements:

The candidates must have a primary degree in a field related to **Polymer Engineering, Materials Science, Manufacturing Engineering, Applied Physics or a closely related discipline.**

Candidates should demonstrate a strong interest in polymer materials, advanced manufacturing processes and experimental research.

Experience in one or more of the following areas would be advantageous:

- Polymer processing, extrusion or polymer compounding.
- Polymer materials formulation and additives.
- Materials characterisation, spectroscopy or thermal analysis.
- Optical materials, photoluminescence or radiation-responsive materials.
- Experimental design, data analysis or process modelling.

Previous experience in scintillating materials or particle physics is **not essential**, as relevant specialist training will be provided.

The successful candidate should demonstrate strong analytical and problem-solving abilities, effective communication skills and the ability to work both independently and collaboratively within a multidisciplinary research environment.

Minimum classification of *2.1 honours or equivalent*.

IELTS [International English Testing System] Applicants must have a minimum of 6.5 with no component score less than 6.0.

Project Lead Supervisor:

Dr Declan Devine

PRISM Research Institute

Technological University of the Shannon (TUS), Athlone

Co-Supervisor: Dr Niall Colgan

Head of Department of Computer and Software Engineering Faculty of Engineering & Technology

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For further information, please contact: Declan.devine@tus.ie

Closing date for receipt of completed application form is 5pm 31st October 2026. Interviews will take place within subsequent weeks.

Download TUS Scholarship application form below, put project title in the subject line and email pro@tus.ie:

<https://tus.ie/rdi/research/office/funded-research/>