



Institute of Technology

Ciência sem Fronteiras / Science Without Borders

Postgraduate Project Template

Institution:	Institute of Technology Sligo
Title of Postgraduate Opportunity: (include level of study)	Masters by Research or PhD Research in the monitoring, enhancement and control of polymer processes with a specific focus on the medical industry, particularly bioresorbable and drug eluting medical devices.
PI Name & Contact Details:	Dr Marion McAfee mcafee.marion@itsligo.ie +353 (0) 719155258
Department/School:	School of Engineering
Research Centre /Group:	Bioengineering Research Group/Centre for Design & Innovation
Research Centre/Group website:	http://itsligo.ie/research-innovation/research-welcome/presidents-bursaries-awards/
<p>Brief Summary of PI research / research group /centre activity Research in the monitoring, enhancement and control of polymer processes with a specific focus on the medical industry, particularly bioresorbable and drug eluting medical devices.</p> <p>Over time these devices degrade inside the body and can be used to perform a temporary mechanical function until such time as the body's own tissue repairs. Ideally, the biodegradation rate will match the rate of regrowth of healthy tissue and by addition of biocompatible additives will in fact promote the healing process. Bioresorbable devices are also being increasingly used as dedicated drug delivery devices as they can be implanted at specific sites within the body for targeted therapy to local cells.</p>	
<p>Brief Description of Masters or PhD Project We have a number of research positions available looking at accelerating the development time of such devices. Typically such devices undergo a 'trial and error' approach to design and particularly process development which is both lengthy and expensive. High quality materials such as PLA, PLLA etc have a very high cost and are difficult to process. They tend to break down with acidic by-products if exposed to too much heat during processing. For medical reasons, additives and plasticisers used in technical plastics cannot be utilised making the identification and control of</p>	

suitable processing conditions extremely challenging. The addition of pharmaceutical additives alters the degradation factors of the base polymer, further complicating the manufacture. To achieve good dispersion of particles in the polymer matrix, high shearing conditions are required, though again this tends to cause mechanical degradation. To reduce development time and cost and to ensure reliable and predictable performance of these products it is vital that the influence of typical processing procedures on the degradation and mixing and hence subsequent bioresorption/release behaviour and mechanical properties are fully investigated. Research areas include development of monitoring and control technologies, modelling of process factors on device design, process optimisation, development of computational modelling tools for device and process design.

Key Attributes of Project for Brazilian Postgraduate Students

The medical device sector and manufacturing in particular is of huge economic and social importance in Ireland and especially to the western region. Eleven of the top-twelve global medical technology companies have a manufacturing base here. The group have links with a number of leading multinational medical device companies including Boston Scientific, Allergan and Abbott as well as numerous SMEs in the field of bioresorbable and medical devices. The group have strong collaborative links with Queen’s University Belfast and Athlone Institute of Technology and have been involved in numerous leading international programmes – particularly under European Framework Programme Funding. PI Dr McAfee has been awarded in the region of €1.5million research funding over the last 5 years and is published in over thirty peer-reviewed Journal and Conference publications.

Name and contact details for project queries, if different from PI named above:

As above.

Please indicate graduate disciplines which are eligible for application:

Mechanical/Manufacturing/Process/Electronic Engineering or related; Applied Maths/Physics; Biomedical Engineering

Alignment with Science Without Borders Priority Areas:

Engineering and other technological areas	
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	
Health and Biomedical Sciences	
Information and Communication Technologies (ICTs)	
Aerospace	
Pharmaceuticals	✓
Sustainable Agricultural Production	
Green Chemistry	
Oil, Gas and Coal	
Renewable Energy	
Minerals	
Biotechnology	
Nanotechnology and New Materials	
Climate Change	
Biodiversity and Bioprospection	
Marine Sciences	
Productive Inclusion and Social Technologies	
Housing and Sanitation	