

QUB - Mechanical and Aerospace Engineering PhD Project 2019-2020

Title: Novel Nanohybrid Coatings for Controlling the Degradation Rate of Bioresorbable Medical Devices

Project description:

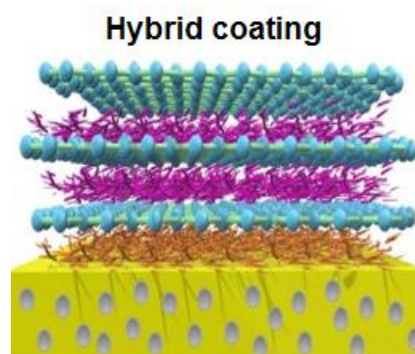
Bioresorbable implants offer significant advantages over permanent implants for both cardiovascular and orthopaedic applications and offer the potential for restoration of normal tissue function. They are designed to naturally degrade in the body once they have served their temporary structural support role, therefore do not need to be removed by a second retrieval operation.

For example, in cardiovascular stenting the stent only needs to be present for a period of 6–12 months, during the artery healing process. Recently, biodegradable metallic stents based on magnesium (Mg) alloys have been developed and investigated as alternatives for the currently-used permanent cardiovascular stents. However, their degradation rate in the body is too fast and surface treatment technologies need to be developed to control this rate and therefore allow tissue healing prior to bioresorption.

The student undertaking this inter-disciplinary project will have the opportunity to work with a team of multi-disciplinary experts from Engineering, Chemistry, Medicine and Biology, and will gain access to a wide range of state-of-the-art facility under the MATCH (Materials and Advanced Technology for Healthcare) Pioneer Research Programme at Queen's.

Aims and Objectives:

This PhD project aims to develop a novel hybrid coating that incorporates biocompatible polymer and graphene based nanomaterials. Advanced materials processing and fabrication techniques will be deployed to produce coatings with controlled structure and properties, suitable for application in bioresorbable devices. The biocompatibility of the coating (and degradation products) as well as its effectiveness in regulating the degradation profile will also be evaluated. There is further potential to incorporate therapeutic agents within the coating, for which controlled release can be triggered by local changes in the biological environment (for example to address infection).



Key skills required for the post: Students with at least an upper second (2:1) class degree in a relevant discipline (e.g. Mechanical Engineering, Chemistry, Chemical Engineering, Physics, Materials Science, Pharmacy, or related subject) are invited to apply. Research experience at Undergraduate level or a Master's degree in a related area would be highly beneficial. The candidate should be proficient in both oral and written communication.

Key transferable skills that will be developed during the PhD:

- Familiarity with working in a multidisciplinary research environment
- Project and time management skills
- Experimental design and interpretation of research findings
- Effective dissemination of research through presentation at international conferences and publication in high quality technical journals.
- Interpersonal skills within a multidisciplinary team including academics, clinicians and industrialists
- Awareness of the societal impacts and commercialisation roadmap for healthcare technologies

Lead supervisor:

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Other supervisor(s):

Professor Fraser Buchanan,
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Guaranteed stipend:	This EPSRC Studentship will include a stipend of approx. £14,925 (2019-20), with funding available for 3.5 years. Eligibility includes UK residency (https://epsrc.ukri.org/skills/students/help/eligibility/)
Conditional top-up available:	Competitive award of £3000/year available for student with 1st class honours and exceptional performance at interview.
PhD students in the School have the opportunity to apply to be demonstrators on undergraduate modules. Compensation for this can amount to £2,400 per year.	

Queens University Belfast is a diverse and international institution which is strongly committed to equality and diversity, and to selection on merit. Currently women are under-represented in research positions in the School and accordingly applications from women are particularly welcome.