PhD Studentship

Dr Gemma-Louise Davies

PhD project: Responsive Magnetic Nanoparticle Based Protein Purification
Supervisor: Dr Gemma-Louise Davies, Professor Matthew Gibson and Dr Daniel Mitchell (joint supervisors)
Funding availability: Midlands Integrative Biosciences Training Partnership (MIBTP) at the University of Warwick
Deadline: 7th January 2017

Project description:
Protein expression underpins nearly all bioscience and biotechnology in terms of either application or understanding. A key challenge in this remains the isolation of the intact, folded proteins, usually with chromatography. In this project, we will explore the use of responsive magnetic nanoparticles as alternatives to a traditional stationary phase. Particular advantages of this approach include the huge range of potential functionality which can be embedded on the particles to enable both traditional binding motifs (such as oligo-histidine and biotin tags) but also new ones based on reversible covalent immobilisation such as sortase-mediated ligation. Finally, the purification of high-value carbohydrate binding proteins, particularly lectins, but also antibodies, will be achieved by this method, which is currently challenging, contributing to their high cost and slow translation as therapeutics or drug targets. The use of particles also maximises accessible surface area for protein capture. By using magnetism as the isolation route, little or no infrastructure is required, and the particles will be fully reversible. A dynamic polymer coating on the nanoparticle surface will prevent non-specific interactions (which is the prime reason for impurities in current methods) and also enable the particles to be recycled for repeated usage. A unique feature of this will be the capture of metabolically labelled proteins and glycans, removing the need for any protein engineering.
By using established, rigorous synthetic procedures, this project will focus on the isolation of high value, challenging proteins, not on the synthesis of the particles, and is therefore very focused on the bioscience.

Requirements:
Applicants should have an honours degree (at least II.1 or equivalent) in chemistry, or other relevant discipline, and should be a UK citizen or have been a resident in the UK for three or more years.

How to apply:
Please direct informal enquiries and requests for further information to Dr Gemma-Louise Davies (G-L.Davies@warwick.ac.uk) and visit http://www2.warwick.ac.uk/fac/cross_fac/mibtp/pgstudy/phd_opportunities/ for more information about the PhD programme.
Details on the formal application procedure can be found at http://www.go.warwick.ac.uk/pgapply