Engineering Doctorates

AT THE UNIVERSITY OF BIRMINGHAM WITH IMERYS

If you are torn between staying on at University and working in industry then the Engineering Doctorate (EngD) might be the solution you are looking for. Instead of studying for a PhD in a University laboratory you could be carrying out industrially relevant research within a sponsoring company whilst gaining your Doctorate at the same time. The pay is also equivalent to a good starting salary in industry. This is exactly what five young Research Engineers are doing with Imerys Minerals Ltd. in Cornwall.

Rachel Thomas and Richard Tamblyn are both third year Research Engineers working at Imerys, St Austell, but under the supervision of academics at the Department of Chemical Engineering at the University of Birmingham. Imerys is one of world's largest producer of fine industrial minerals especially calcium carbonate and kaolin and both EngD projects are involved with adding value to these particles. The kaolin is mined by using giant hose pipes to blast the fine china clay out from the surrounding bedrock. You may well have visited an old kaolin quarry, as that is where you will find the Eden Project.

Rachel Thomas originally studied Chemical Engineering at Birmingham University, but is now carrying out her Doctorate in the calcination (heat treatment) of kaolin. The calcination process causes the kaolin to become whiter and brighter than the hydrous form, leading it to increase in value and usage. Calcined kaolins are used in a wide range of everyday products, from paint and plastic to pharmaceutical rubbers and PVC plastics. Rachel is working to develop a better understanding of the calcination reaction, in order to enhance the efficiency, quality and sustainability of calcining operations within Imerys.

Richard Tamblyn graduated in 2005 from the University of Cambridge and decided to return to his native Cornwall to study the mechanical activation of minerals. His work looks at improving the efficiency of grinding processes as well as using mechanical activation to promote chemical reaction. This should lead to overall improvement in process efficiency as well as the possibility for novel products. Particle size reduction is one of the largest energy costs within minerals processing and therefore improving top-down routes for the formulation of ultrafine particles has significant benefits in reduction of the carbon footprint of Imerys' products. Additionally, Richard uses a large range of techniques for particle characterisation, available through Imerys, the University and international collaborators.

Another final year Research Engineer is working on the release of biocides from paint films containing Imerys' minerals. Existing biocides based on copper have recently been banned by the EU so developing the next generation of controlled release biocides is a major challenge. These biocides are important in the protection of ship's hulls to prevent attachment of barnacles and seaweed which can considerably increase the drag and increase fuel consumption. Yao Kanga (a Biochemist from University College London) is currently working on isothiazoline biocide desorption from paint films containing varying minerals. The project involves using engineered mineral particles the release time of the adsorbed biocides.

Imerys' minerals are also used in the plastic industry as fillers. Did you know that approx 20 % of your car bumper and the plastic interior is finely dispersed minerals? The type of mineral in the bumper will have a big impact on the properties of the plastic. Paul Jones (a chemist from the University of Hull) is working on blending even finer minerals into plastics. By creating a good mixture of minerals in plastics, a whole host of properties can be improved. Car bumpers require materials that have a low weight but also a high strength under impact. Despite their natural strength, metals are too heavy and they greatly reduce the vehicle's efficiency. Nowadays almost all metallic car parts have the potential to be replaced if we can improve plastic in certain key areas. Paul's project involves taking inexpensive starting materials and applying different treatments to the minerals with the aim of providing a maximum benefit to the polymer. One treatment performed has improved the impact strength of the plastic by over 50 times.

Finally, Stephen Mee, another Birmingham graduate but from the Materials Department, is developing novel materials using a technique called chemical self-assembly. This technique uses the surface chemistry and electric charge of small particles to build intricate porous structures that will have both lower densities and useful optical properties.

All these projects have industrial and academic supervisors and in the case of these five students their academic supervisor is Dr Neil Rowson. The programme is supported by the U.K. Government via the EPSRC. To be eligible for the tax free bursary of £ 19,600 p.a. then candidates must have a relevant first degree in a Physical Science, Maths, Materials or (Bio) Chemical Engineering, plus be a UK national. Funding is available for certain EU nationals provided they have a relevant first degree and have resided in the UK for more than three years. For more information on the programme visit www.eng.bham.ac.uk/chemical/pg/engd/positions.htm or for more information on Imerys visit www.imerys.com