EPSRC supported Engineering Doctorate (EngD) project

Tax free bursary £18,800 p.a. plus fees

Project title: Investigating powder catalyst manufacturing processes to product quality and performances

Company title: Johnson Matthey (JM); Location: Teeside

Academic supervisor(s): Dr Alessio Alexiadis / Dr Andrew Ingram (School of Chemical Engineering, University of Birmingham)

Company: JM is a global company with operations in over 30 countries adding high value to catalyst technology products and services.

Objective:

The aim is to apply a number of modelling platforms (such as Discrete Element Modelling DEM & Finite Element Modelling FEM) and some experimental characterisation tools to investigate two important catalyst formulations and manufacturing unit operations: milling and powder compaction.

1. Milling: Modelling energy distributions and transformation mechanisms in high energy ball milling

The scope will be to understand the amount of energy generated and transferred to the system during the milling process in order to compare not only the total energy input in each of them but also the type of forces involved (friction, impact or rolling) and local temperatures. The models will be applied to several milling length scales in order come-up with a fundamental understanding of the process mechanics by exploring a number of key operational variables (mill geometry, speed, type and volume of milling media and milling regimes), on one or more model chemical systems.

2. Tableting: relate powder feed properties to pellet shape, manufacturability and tablet properties

The aim is to develop and implement appropriate constitutive models that capture the evolution of ceramic catalyst powder from a loose state into a dense compact. The powders will be characterised using an experimental "compactor simulator" equipped with a fully instrumented die. The predicted density variations within differently shaped pellets will be compared to X-ray tomography measurements (or other techniques eg. Terahertz). Physical properties such as elastic modulus and tensile strength will be characterised by nano-indentation. A selected number of feed formulations with different properties will be included in the study, for example: size, density, shape, lubricant amount, compaction aid, binder amount.

Training and opportunities: Full engagement and support from the JM team during the EngD.

To be eligible for EPSRC funding candidates must have at least a 2(1) or a 2(2) plus MSc in an Engineering/Scientific discipline. Applications from EU students who have studied in the UK are welcome as well as from candidates with three years relevant industrial experience. Please email your c.v. to the EngD manager: chem-engd@contacts.bham.ac.ukFor more details visit http://www.birmingham.ac.uk/schools/chemical-engineering/postgraduate/index.aspx and click on EngD.