

## Imperial College London

### Department of Mechanical Engineering

#### PhD Studentship in Advanced Tomographic Microscopy for Damage Modelling in Steels

Applications are invited for a research studentship in the field of Advanced Tomographic Microscopy for Damage Modelling in Steels, leading to the award of a PhD degree. The post is supported by a bursary and fees (at the UK/EU student rate) provided by EPSRC. The studentship is for 3.5 years from October 2011 (or to start soon after) and is available for UK and EU candidates meeting the Research Council criterion of having been resident in the UK for the previous three years. The student will benefit from collaboration with Tata Steel, a leading global metal processing company. Tata Steel will also provide a bursary top-up; the total bursary will be approximately **£19,000 per year tax-free**. The student will also benefit from use of the Diamond Light Source, and interactions with scientists at both the Diamond facility and University of Manchester.

The research project combines tomographic (micro-CT and high-resolution synchrotron) measurement methods with multiscale constitutive equation development and micro-scale finite element modelling for advanced characterization and prediction of damage during the thermomechanical processing of steels. The primary aims of the project are to (i) gain insight into damage nucleation and evolution under high temperature and stress conditions typical of rolling by tomographic observations and (ii) develop new modeling methods for Tata steel applications by coupling initial tomographic characterisations to micro-FEM models. The major tasks are:

- Initial microstructure definition, e.g. matrix/precipitate boundaries, by micro-CT and/or ex-situ synchrotron tomography with grain structures statistically equivalent to experimental measurements (by e.g. EBSD) using custom software; microstructures will be input to micro-FEM models with grain deformation modeled using crystal plasticity theory, and interface separation modelled using cohesive zones or extended finite element techniques.
- Calibration of interface damage and grain and precipitate material models through synchronization of predicted micro-FEM deformation and damage/decohesion with high temperature in-situ synchrotron tomographic measurements (obtained from a companion PhD project) at key stages in the deformation (rather than by macroscopic calibration to stress-strain curves).

You will be an enthusiastic and self-motivated person who meets the academic requirements for enrolment for the PhD degree at Imperial College London. You will have a background in Mechanical or Aeronautical Engineering, Materials Science, Physics or a related field and an enquiring and rigorous approach to research together with a strong intellect and disciplined work habits. Training will be given in multiscale modelling methods, metal forming and related processes, and experimental methods such as x-ray tomography, metallography and electron microscopy. You will become a skilled communicator, comfortable in an international situation. Good team-working, observational and communication skills are essential.

To find out more about research at Imperial College London in this area, go:  
<http://www3.imperial.ac.uk/mechanicalengineering>

For information on how to apply please go to:  
<http://www3.imperial.ac.uk/mechanicalengineering/research/phdopportunities/>.

For further details of the post contact Dr Daniel Balint [d.balint@imperial.ac.uk](mailto:d.balint@imperial.ac.uk). +44 (0)20 7594 7084 or Professor Jianguo Lin [jianguo.lin@imperial.ac.uk](mailto:jianguo.lin@imperial.ac.uk) +44 (0)20 7594 7082. Interested

applicants should send an up-to-date curriculum vitae to Dr Balint on the above e-mail address. Suitable candidates will be required to complete an electronic application form at Imperial College London in order for their qualifications to be addressed by College Registry.

**Closing date: (one month from insertion date)**

*Committed to equality and valuing diversity. We are also an Athena Silver SWAN Award winner, a Stonewall Diversity Champion and a Stonewall Top 100 Employer 2011*