Understanding the role of TiN precipitation on hot tearing susceptibility of steels
PhD

Funding: EPSRC – TATA Steel iCASE award for 4 years
Start Date: 1 October 2016
Supervisors: Dr Prakash Srirangam, Professor Barbara Shollock

Project Overview:
This project is with leading researchers in WMG's Steels Processing Group, as well as TATA Steel Europe.

Hot-cracking in continuous casting of steels has been a major problem in steel industries for many years. In continuous casting, hot tearing can lead to surface and sub-surface cracking and, in the worst case, end up in a shell breakout. This type of defect severely limits the productivity and causes health hazards and equipment damage. Despite this outstanding practical relevance, there is still relatively little knowledge about hot cracking during continuous casting of steels. Several criteria based on extensive modelling and simulation of continuous casting of steels have been performed in the past, but the problem is prevalent and the mechanism is not completely understood. Recent simulation studies show that significant microstructure differences between the steel grades and presence of precipitates such as TiN during initial solidification conditions could affect the hot tearing susceptibility of steel during continuous casting process.

The aim of the project is to understand the role of alloying elements on hot tearing susceptibility of steels during continuous casting at high temperatures, using synchrotron based characterisation techniques. By complementing synchrotron characterisation with thermodynamic simulations and high resolution TEM characterisation, it would be possible to throw more light on understanding the mechanism of hot tearing susceptibility during continuous casting and the effect of TiN precipitation on hot tearing of steels.

In addition to performing experiments (Gleeble, optical microscopy, SEM and TEM) at WMG, the successful applicant will have an opportunity to collaborate and work closely with eminent scientists at TATA Steel Europe as well as with national laboratories such as Advanced Photon Source (APS), USA and Diamond Light Source, UK.

Funding:
This position provides an annual stipend of £14,000 with an additional industry top up of £3,000 per annum (for UK nationals).
Tuition fees will be paid UK/EU nationals for up to 4 years.

Eligibility:
Applicants with a first class or upper second Bachelor’s or a Master’s degree in Metallurgical Engineering/ Materials Science/Physics/Chemistry. Knowledge of physical metallurgy, casting and solidification is desirable.

Apply:
Interested applicants are encouraged to contact Dr. Prakash Srirangam (P.Srirangam@warwick.ac.uk) for further information of the project. To apply, please complete our online enquiry form.