Simulation and experimental validation of damage in ferritic/martensitic materials

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Ferritic/martensitic steels show very good resistance against radiation damage thus have been used in nuclear fission industry for a long time and are alterative candidates to be used in structural components of future fusion reactors. Their microstructure is complex which makes the simulation of their behaviour under extreme conditions time-consuming. However, recent developments in computational power and parallelised GPU calculations has made detailed simulation of such materials through cutting edge modelling techniques such as crystal plasticity finite element modelling possible. In this project you will be working with a team of researchers from University of Bristol to develop simulation techniques that are capable of modelling mechanical failure of ferritic martensitic materials. The project is connected to a large European project (ENTENTE) on this subject and you will be expected to interact with our European partners in particular the EDF team in France. While the project is defined within the context of the nuclear fission industry, you will be working with Culham Centre for Fusion Energy to transfer knowledge of simulating mechanical damage in ferritic/martensitic materials to fusion industry. The main focus of the project is simulation but you are expected to carry out a number of experiments to validate your simulations. You are likely to be called on helping the Solid Mechanics Research Group (SMRG) members carry out complex experiments at large national and international facilities (e.g. synchrotrons) related to the project. Therefore, it is important that you are willing to travel within and outside the UK.

Based in the Department of Mechanical Engineering at University of Bristol (UoB), SMRG focusses on industrially-relevant research in support of low carbon energy sector in the UK. Since 2008 SMRG has had research partnership with EDF Energy, who are responsible for operating the existing fleet of UK nuclear power plants. The research has recently expanded to close collaboration with UK Atomic Energy Agency (UKAEA) at Culham Centre for Fusion Energy. This has broadened the facilities and SMRG's structural integrity activities to include fusion as well as fission. SMRG currently has eight academic staff and approximately 20 students and research staff.