MONASH University
Centre for Electron Microscopy

SEMINAR

TEM Analysis of Pure Iron and FeCr Model Alloys Ion Irradiated within the JANNuS Platform (in and ex-situ mode)

Dr Brigitte Décamps

Centre de Spectrométrie Nucléaire et de Spectrométrie de Masse, The University of Paris-Sud, France

Thursday, 3 February 2011
12 noon – 1 pm
Science Lecture Theatre S9, Building 25

Abstract

Damage displacement cascades and helium production by transmutation reactions will result from the intense neutron irradiation in the structural materials of future Fusion and GenIV reactors. It is a major concern since the combined effect of helium and cascades may induce strong embrittlement and swelling. In order to predict in-service properties of such materials in the various radiative environments, the microstructural evolution under irradiation of model materials (pure Fe and Fe-Cr alloys) using the JANNuS (Joint Accelerators for Nano-science and Nuclear Simulation) platform has been studied. Such platform is designed to supply a large range of ion irradiation and implantation conditions, allowing in-situ Transmission Electron Microscopy (TEM) and ion beam analysis with single, dual or triple beam combinations. Such a facility has no equivalent in Europe and will play an essential role for multi-scale modelling of irradiation effects in materials.

Single- and dual-beam irradiations (Fe and Fe/He) have been performed ex-situ and in-situ (TEM) at high temperature. TEM observations (bright-field, weak-beam) have been made to study the evolution of the microstructure under irradiation. For example, single-beam in-situ irradiations show a difference between iron and Fe-5at.%Cr : dislocation loops formed during irradiation display back-and-forth motion in iron but not in the alloy. They interact with dislocations in the alloy. The effect of Cr content and He (dual-beam) on the microstructure evolution under irradiation will be discussed.

Convenor: Associate Professor Joanne Etheridge
Email: joanne.etheridge@mcem.monash.edu.au

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