Monash Centre for Electron Microscopy Seminar

In situ TEM – Possibilities and Challenges

Thursday 30 August, 2018

11.00am

Lecture Theatre S1
16 Rainforest Walk
Monash Clayton Campus

Dr Christian Kübel

Karlsruhe Institute of Technology

In situ transmission electron microscopy (TEM) techniques have developed tremendously during the last decade providing the possibility to use the full power of electron microscopy to follow the structural, chemical and morphological changes during reactions and processes, thus providing direct insight into the related mechanisms. In particular, thermally, electrochemically or mechanically induced transformations/reactions have been studied extensively with the advances of MEMS based in situ setups for electron microscopy. This has resulted in a significantly improved materials understanding. However, care has to be taken in interpreting the in situ results considering sample preparation and electron beam damage of the sample as well as environmental effects and the reduced sample dimensions. With this presentation, I will introduce some of our recent results illustrating the possibilities and challenges in situ TEM provides for understanding & modelling processes in nanostructured materials using thermally induced growth of nanocrystalline graphene (Figure 1) and magnetic domain formation in FeRh thin films (Figure 2) as two examples. In addition, the effects of the electron beam and the environment inside the TEM on in situ measurements, both in terms of structure and materials properties & kinetics, will be critically discussed.

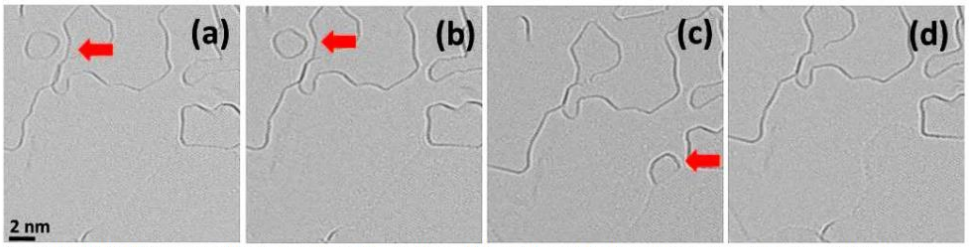

Figure 1: HRTEM images of the fast motion of a graphene flake followed by lateral merging with a preexisting boundary during growth of a freestanding nanocrystalline graphene film at 1200 °C inside the TEM.

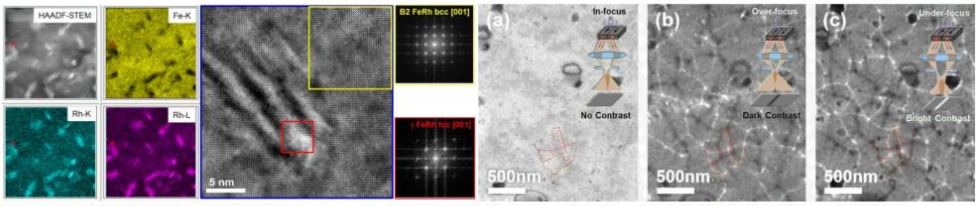

Figure 2: STEM-EDX and HRTEM images of γ FeRh precipitates in a freestanding B2 FeRh thin film, which influence the magnetic domain formation during the thermally induced antiferromagnetic to ferromagnetic phase transition (left), Selected frame of an *in situ* Lorentz microscopy series revealing the magnetic domains (right).

Convenor: Assoc Professor Matthew Weyland
Email: mcem@monash.edu
Tel: 9905 5563

Visitors are most welcome. Please not that there are designated visitor car parks and tickets, at a cost of $2.00 per hour or $10.00 all day are available from parking meters. Payment is by coin, credit card, or phone app. Further details can be found at the following links: http://www.monash.edu/people/transport-parking/permits/metered-free and http://www.monash.edu/__data/assets/pdf_file/0010/71686/16P-0006-T2-Clayton-map_final.pdf