MONASH University
Centre for Electron Microscopy

MONASH University
School of Physics

SEMINAR

Applications of low voltage STEM-EELS: from single atom spectroscopy in 2D materials to structure determination in complex oxides

Dr Quentin Ramasse

SuperSTEM Laboratory
STFC Daresbury Campus, Daresbury, U.K.

Wednesday 25 September, 2013
11.00 am –12.00 noon
Location: Building 29, Theatre S14

Abstract

Modern aberration-corrected scanning transmission electron microscopes have been optimised to provide improved data collection ability and greater flexibility even at low acceleration voltages, and a wealth of complementary analytical signals is now available from a single experiment [1]. When combining Z-contrast and bright field STEM imaging, 2D chemical mapping together with advanced image analysis, it is possible to statistically determine chemical variations in complex oxide structures across a range of compositions, and to relate those to accurately measured atomic displacements. Similarly, the development of so-called 'gentle', dose-controlled STEM techniques has been particularly beneficial for the field of two-dimensional materials. By reducing the acceleration voltage to overcome knock-on damage limitations, many of these structures can be imaged directly at atomic resolution, revealing for instance the propensity of graphene to spontaneously 'heal' itself when perforated [2]. Having shown what atomic species are present and where single atom impurities or defects are located using spectroscopy, some fundamental questions remain: how exactly are these atoms bonded to one another and how do structural differences affect their electronic configuration? Answers to these questions can be provided one atom at a time by EELS fine structure analysis, which can distinguish unambiguously between bonding configurations [3].

[1] I. MacLaren et al., APL Materials. 1 (2013), 021102.
[2] R. Zan et al., Nano Lett. 12 (2012), 3936.
[3] Q.M. Ramasse et al., Nano Lett. Art. ASAP (2013) doi:10.1021/nl304187e.

Convenors: Professor Joanne Etheridge, MCEM
and Dr. Scott Findlay, School of Physics
Email: mcem@monash.edu
Tel: 9905 5563

Visitors are most welcome: Please note the parking arrangements. There is a designated Visitors Car Park (N1) clearly ground-marked by white paint and tickets, at a cost of $7.70/day, are available from a dispensing machine. ('Blue' permit designated areas are for Monash members only). It is also possible to park at other designated Visitors Car Parks (E1, S1 and S2) on the Clayton Campus, but tickets are $3.30/hour.
Printable version of the Clayton campus map (pdf 833 kb) (Please right click to open link)