MONASH University

Atomic Structure of Nanostructured Materials

(Top up scholarships of $5,000 per annum - Several projects in materials science and physics)

The important and unique properties of nanostructured materials are often governed by a handful of atoms located at key positions within the material, such as at interfaces. Computer chips are famous examples. The integrity of just one or two atomic monolayers at the gate oxide interface can change its electrical resistance by one hundred fold.

If we are to understand and manipulate the properties of nanostructured materials, it is critical to understand the local atomic structure. However, determining the arrangement and bonding of small numbers of atoms has hitherto been extremely difficult to do.

Several pure and applied PhD projects addressing this problem are on offer. They all involve the application of the world class “Double aberration corrected Titan” transmission electron microscope recently installed in the Monash Centre for Electron Microscopy. This is the first instrument of its type outside North America. It has a range of advanced diffraction and imaging capabilities and has a spacial resolution better than 0.8Angstrom, one of the highest resolution microscopes worldwide.

Specific project areas include:

- The development of a new method for the determination of the atomic structure of nanoparticles.
- The application of new ultrahigh resolution electron diffraction and microscopy methods to determine the atomic structure, and hence structure-property relationships, in strategically important nanostructured materials (such as cuprate superconductors and core-shell nanoparticles).
- The development of the theory of electron scattering using ultrasmall electron beams (<1Angstrom) and its application to the interpretation of diffraction and imaging experiments of nanostructured materials at the highest spatial resolution.

Some projects may involve visits to international collaborators at the University of Cambridge, the Canadian Centre for Electron Microscopy and Oxford University.

Top-up scholarships of $5,000 pa area available to candidates with APA or equivalent scholarships.

To discuss project details, please contact A/Prof Joanne Etheridge on (03) 9905 1836 or joanne.etheridge@eng.monash.edu.au.