



2 Doctoral (PhD) Scholarship Opportunities

How will engineers respond to the challenges arising from global warming? One response is in the design and development of new, high-strength light alloys that have high specific strength and toughness for applications in aerospace, automobiles and structural engineering in ways that reduce energy consumption.

An approach to reach high specific strength and toughness is through design in nanostructured materials, which is one of the hottest research areas in all of science and technology. Nanostructured materials are defined as materials with structural features such as grain size smaller than 100 nm in at least one dimension. These nanostructural dimensions bring about quantum and other size containment effects that produce unique mechanical, chemical and physical properties, the likes of which are not available to their coarse-grained counterparts. A current challenge for material scientists is in the development of light structural alloys that possess *both* high strength and high ductility. Whereas the combination of these properties is metallurgically difficult in coarse-grained materials, such combinations have been achieved in some nanostructured materials.

We are looking for self-motivated people to undertake PhD research to help us to design and develop extraordinary combinations of high strength and ductility in advanced aluminium alloys.

The projects available here require that we learn and develop new insights into the fundamental mechanisms of deformation and how these relate to nanostructure. We have devised two PhD projects:

PhD Program #1: Structures and their Effect on Deformation Mechanisms in Nanostructured Materials Processed by Severe Plastic Deformation

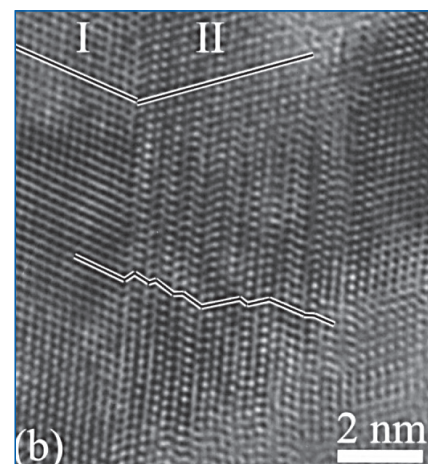
(Supervisor: Dr Xiaozhou Liao, Associate Supervisor: Prof. Simon P. Ringer); and

PhD Program #2: Stability of Properties and Structures in Nanostructured Alloys Processed by Severe Plastic Deformation

(Supervisor: Prof. Simon Ringer, Associate Supervisor: Dr. Xiaozhou Liao).

These projects will be carried out in the *Australian Key Centre for Microscopy and Microanalysis* at the University of Sydney, which is also headquarters for the *Australian Microscopy & Microanalysis Research Facility (AMMRF)* and a major node of the *ARC Centre of Excellence for Design in Light Metals*. These projects, in the above research environment, will provide opportunities for the development of world-class skills and knowledge in electron microscopy and atom probe tomography and, ultimately, in the design of structure-property relationships in these exciting alloys.

The scholarships are valued at \$24,000 per annum (tax-free) on a full-time basis. The scholarships are renewable for up to three years, subject to satisfactory research progress. An honours 1 or 2A or a Master degree is required for the scholarship applicants.



High-resolution TEM image showing evidence of a deformation mechanism in nanocrystalline Cu – partial dislocation emissions from a grain boundary, leaving behind stacking faults and nano-twins (by Liao et al., *Appl. Phys. Lett.* 84 (2004) 592).

Further Information:

Dr Xiaozhou Liao

Lecturer and QEII Fellow
Phone: +61 2 9351 2348
Email: xzliao@aeromech.usyd.edu.au
School of Aerospace, Mechanical & Mechatronic Engineering
The University of Sydney
NSW 2006, Australia

Prof. Simon Ringer

Phone: +61 2 9351 2351
Email: s.ringer@usyd.edu.au
Australian Key Centre for Microscopy and Microanalysis
The University of Sydney
NSW 2006, Australia