UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Te Tari Pūhanga Pūrere|Mechanical Engineering Department

MECH Seminar Series 2024

Thursday, 15 February 2024
11 am
E16 (Rātā Bldg)

Advanced STEM Characterization of Solute Clusters, Precipitates and Solute Segregation in Light Alloys

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Abstract:
Solute clustering, precipitation and solute segregation often occur in light alloys of magnesium, aluminium and titanium, and their occurrence can strongly affect microstructure evolution and deformation behaviour of the alloys. Solute clusters may provide stronger strengthening effects than individual solute atoms and therefore have stronger influence on plastic deformation, in addition to their role in precipitate nucleation. Solute segregation can influence thermodynamic and kinetic features of an interface boundary. While such phenomena have been known for a long time, they are still not well understood at the atomistic level, and a key reason for this is the lack of atomic-scale experimental observations on the precise distribution of solute atoms in the clusters, nano-scale precipitates and the segregation. It is for this reason that the precise roles of micro-alloying elements in microstructure evolution remain speculative. Advances in aberration-corrected scanning transmission electron microscopy (STEM) in the past 20 years provide opportunities for detecting segregated solute atoms and solute clusters at the atomic scale and to reveal the precipitate formation mechanisms when these techniques are combined with atomic-scale computations. This talk will provide an overview of some of our recent studies made by the STEM imaging and mapping techniques on solute clustering, precipitation and solute segregation in selected alloys of magnesium, aluminium and titanium.

Bio Sketch:
Jian-Feng Nie is a professor of the Department of Materials Science and Engineering at Monash University. His research interests cover physical metallurgy of magnesium alloys and aluminium alloys, biodegradable metallic materials, precipitation and solid-solid phase transformations, applications of scanning transmission electron microscopy in materials characterization, and processing-microstructure-property relationships in metallic materials. He is editor of Metallurgical and Materials Transactions, member of Board of Governors, Acta Materialia Inc., and Chair of National Event Committee of Materials Australia.

All are welcome!