
MM 47: Invited Talk (Hauptvortrag) Robinson

Time: Thursday 9:30–10:00

Location: BAR 205

Invited Talk MM 47.1 Thu 9:30 BAR 205
Coherent X-ray Diffraction Imaging of Excitations in Metal Nanoparticles — •IAN ROBINSON — University College London, UK — Research Complex at Harwell, UK

The physical reason why nanoparticles differ in structure from the bulk is fundamentally crystallographic. As with all surfaces, the missing-neighbour unit cells, which become removed to create a surface, cause a structural response. In a metal this is an inward relaxation, detectable as crystal strain. Where two surfaces meet along the edge of a crystal, the effect is enhanced. Nanocrystals are in precisely the size range which is dominated by these surface and edge properties. This results in a pattern of strain which follow the crystallographic structure of the particle. Certain simple properties of nanoparticles

can be explained through these structural differences. Coherent X-ray Diffraction can be used to study these effects within the three dimensional structure of nanocrystals. A key experiment will be discussed that uses this method to study the redistribution of strains on the surface of a Au nanocrystal by adsorption of a chemical layer [1]. Ultrafast imaging with free-electron laser sources allows visualization of the strain patterns in vibrating crystals [2].

[1] Differential stress induced by thiol adsorption on faceted nanocrystals, Moyu Watari, Rachel McKendry, Manuel Voegtli, Gabriel Aeppli, Yeong-Ah Soh, Xiaowen Shi, Gang Xiong, Xiaojing Huang, Ross Harder and Ian Robinson, Nature Materials 10 862-866 (2011) [2] Ultrafast three dimensional imaging of lattice dynamics in gold nanocrystals J. N. Clark et al Science 341 56 (2013)