

Specialized iNANO lecture

- open to all

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Title: Light next to heavy: unexpected chemistry of hydrogen in metals

Time: Thursday 21 January 2010, at 15.15

Location: 1531-113 Aud-D1, Department of Mathematical Sciences

Abstract: In this lecture I'll try to show a diversity of crystallographic applications in materials chemistry, introducing you to the world of the big experimental facilities, third generation synchrotrons and neutron spallation sources. The main focus will be detection of the lightest element in the periodic table, hydrogen, by diffraction techniques by combining *in-situ* and high-resolution powder X-ray and neutron diffraction (PXD and PND). Hydrogen is the weakest scatterer of X-rays but a strong scatterer of neutrons, therefore, the combined use of PXD and PND is an excellent way to reveal puzzling behaviour of hydrogen in metals, i.e. structural investigation of new metal-hydrogen compounds, intermediate phases, metal atom reconstruction, formation of stable metal-hydrogen (MH) clusters, etc.

The main challenge, however, remains to understand the nature of metal-hydrogen interaction and discover new M-H compounds capable to store large amounts of hydrogen. Intercalation of hydrogen into a metallic matrix is often described by an outdated geometrical model, which interprets localization of hydrogen atoms by a size of an occupied void and by repulsive H...H interactions. Our studies of hydrogen reveal a rich chemistry of metal-hydrogen interactions, which suggest a partly covalent bonding between transition metals and hydrogen atoms.