

Hydrogen Storage Materials - Playing the Odds

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This talk focuses on our recent studies of novel lightweight hydrides drawn from a combination of the first four “odd” elements, H, Li, B and N. There is an enormous variety of hydrides formed solely from a combination of these four elements. This talk will highlight the strategies that we have adopted to undertake a combinatorial search of lightweight hydrides with a particular focus on high resolution X-ray and neutron powder diffraction that play a central role in both the discovery and characterisation of these new materials.

High resolution synchrotron X-ray diffraction has been performed on the ID31 diffractometer at the ESRF, Grenoble. Our experiments fall into two different classes: (i) rapid combinatorial screening of hydride phase diagrams and (ii) in-situ studies of both the synthesis and decomposition of novel hydrides. Examples will be presented that illustrate both these approaches and show how both structural and microstructural information may be extracted that reveal the atomic nature of hydrogen absorption and desorption.

Our neutron diffraction studies have been performed on the GEM and HRPD diffractometers at the spallation neutron source, ISIS, at the Rutherford Appleton Laboratory. Again our experiments fall into two categories: firstly, the detailed structural characterisation of novel hydrides, including the accurate determination of hydrogen positions and secondly simultaneous neutron diffraction and gravimetric analysis using a specially adapted HIDEN IGA apparatus in-situ on both the GEM and HRPD beamlines. Preliminary results from experiments will be presented that highlight the power of these combined measurements