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High Capacity and Reversible Hydrogen Storage in Porous Metal-Organic Framework Materials

The application and use of porous framework materials is a very timely theme with enormous efforts being made world-wide, especially with regard to the development of new H_2 storage materials. The Nottingham group has made exciting and highly significant discoveries by targeting the production of highly porous materials as stores for H_2.

A wide range of micro- and meso-porous materials for reversible substrate inclusion has been prepared and fully characterised. A series of recent high profile papers describe the selective uptake of volatile organic substrates within a highly robust Zn(II) framework,[1] and the storage of H_2 in high connectivity Ni, Fe [2] and Ln [3] materials. Most significantly however, we have recently reported a family of isostructural framework materials in which the pore size increases uniformally with increasing ligand length (Figure 1). This detailed and rigorous study confirms the highest H_2 storage capacity for any such material reported thus far, with a maximum capacity of 7.1% ww and surpassing the DoE target of 6.5% ww. The study also confirms that *intermediate* pores physisorb H_2 most effectively since in this regime adsorbant-adsorbate interactions are maximised.[4] This work was selected for "Research Highlights" in *Nature*, 2006, **443**, 124 (14th September

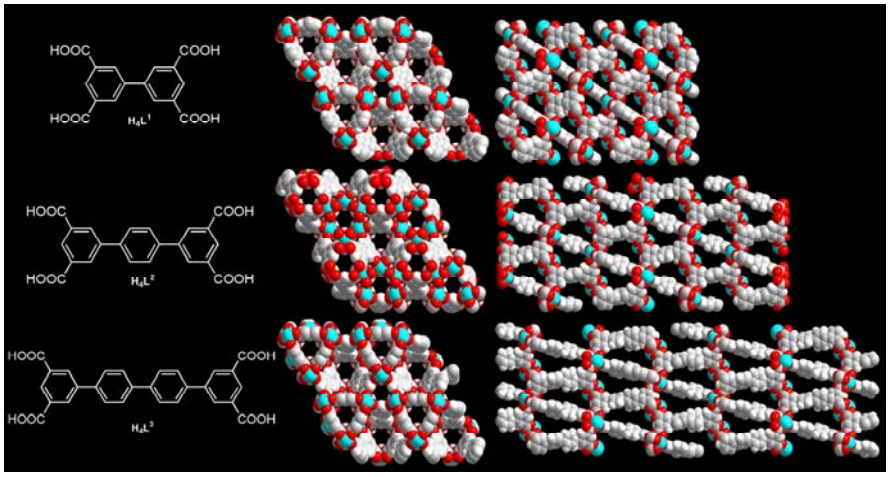

Figure 1. Views of porous frameworks $[Cu_2(L)]$ (H_4L= H_4L^1, H_4L^2, H_4L^3)

issue) and in *Chemistry World* in 9th September 2006 issue.

The use of the EPSRC Swansea mass spectrometric facility was crucial in characterising new ligands and their various precursors, and molecular metal-ligand complexes as building blocks to these porous polymers.

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