7.5 wt% Hydrogen Storage in Metal Organic Frameworks

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The discovery of H_2 adsorption in porous metal-organic frameworks (MOFs) and subsequent related studies have firmly established these materials as interesting candidates for H_2 storage applications, due to the availability of a large numbers of well-characterized MOFs and the flexibility with which their organic and inorganic components can be varied. We have delineated numerous strategies that can be used in MOF chemistry for achieving the targets for on-board H_2 storage systems set by the US Department of Energy (DOE) for use of H_2 as a fuel [1].

Recently, we showed that MOF-177 can store 7.5 wt% H_2 with a volumetric capacity of 32 g L^{-1} at 77 K and 70 bar [2]. This is exciting as the MOF exhibits the highest H_2 uptake of any porous materials and clearly shows that in principle the DOE targets can be achieved at 77 K. However it is important to establish a benchmark material for researchers in the field of H_2 storage because the field has often suffered from reports of high H_2 uptake which were later found to be erroneous.

This presentation will (i) show that the saturation uptake of H_2 in MOFs correlates well with surface area and that viable volumetric densities in highly porous structures can indeed be achieved, (ii) show independent verification of H_2 uptake data in MOF-177 [3], (iii) discuss the differences between absolute versus excess uptake capacities, and (iv) outline future prospects for room temperature H_2 uptake.

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[2] Wong-Foy, A. G.; Matzger, A. J.; Yaghi, O. M. *J. Am. Chem. Soc.* 2006, *128*, 3494.
[3] Furukawa, H.; Miller, M. A.; Yaghi, O. M. *J. Mater. Chem.* 2007, *17*, 3197.