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Hydrogen storage by physisorption on Metal Organic Frameworks

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Cryo-adsorption systems based on materials with high specific surface areas have the main advantage that they can store and release hydrogen with fast kinetics and high reversibility over multiples cycles. Recently Metal Organic Frameworks (MOFs) have been proposed as promising adsorbents for hydrogen. These crystallographically well organized hybrid solids resulting from the three dimensional connection of inorganic clusters using organic linkers show the largest specific surface areas of all known crystalline solids. The determination of the relationships between physical properties (chemistry, structure, surface area ...) of the MOFs and their hydrogen storage behavior is a key step in the characterization of these materials, if they are to be designed for hydrogen storage applications. Excess hydrogen sorption measurements for different MOFs will be presented. We show that maximum hydrogen uptake at high pressure and 77K does not always scale with the specific surface area. A linear correlation trend only apply within a class of specific materials and breaks down when the surface area measurement does not represent the surface sites that are available to H2. The influence of pore size and shape will also be discussed by comparing several MOFs with different structure types. The hydrogen adsorption and binding energy at low pressure are strongly dependent on the metal ions and the pore size.