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An Overview of Hydrogen Storage Materials: Making a Case for Metal Organic Frameworks

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Abstract

One of the major challenges facing the transition to a Hydrogen Economy is the development of a suitable storage medium for hydrogen. Conventionally, hydrogen is stored as compressed gas or cryogenically as a liquid. In order to meet future targets hydrogen needs to be stored in a safe and compact manner by combining the gas with other materials either chemically or physically. Hydrogen storage is therefore an extremely active area of research worldwide with many different materials being examined for use in the storage of hydrogen. Research efforts are focused on enhancing hydrogen storage capacity, thermodynamics and kinetics of hydrogen uptake and release, and cycle life of the materials. Materials that store hydrogen chemically which have been investigated extensively include metal hydrides (e.g. MgH2), complex hydrides (e.g. LiAlH4), amides/hydrides (e.g. LiNH2/LiH) and amidoboranes (e.g. LiNH2BH3). Physisorption materials (e.g. carbon nanostructures and zeolites) have also received considerable attention. In the past decade, there has been growing interest in metal organic frameworks (MOFs) as hydrogen storage materials due to their well-defined structure, tunability, high porosity and large specific surface area. This presentation provides an overview of different hydrogen storage materials along with our research work on MOFs.