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Hydrogen Storage in Metal-Organic Frameworks: A Review

Henrietta W. Langmi[a,*], Jianwei Ren[a], Brian North[a], Mkhulu Mathe[a], Dmitri Bessarabov[b]

aHySA Infrastructure Centre of Competence, Materials Science and Manufacturing, Council for Scientific and Industrial Research (CSIR), PO Box 395,Pretoria 0001, South Africa

bHySA Infrastructure Centre of Competence, CRB, North-West University (NWU), Faculty of Natural Science, P. Bag X6001, Potchefstroom 2520, South Africa

Abstract

Metal-organic frameworks (MOFs) for hydrogen storage have continued to receive intense interest over the past decade. MOFs are a class of organic-inorganic hybrid crystalline materials consisting of metallic moieties that are linked by strong coordination bonds to organic ligands. They exhibit a great structural diversity and possess low weight, exceptionally high surface areas, large free volumes, and tunable pore sizes and functionalities, making them extremely attractive for a variety of applications such as hydrogen storage. For these reasons MOFs have been extensively studied. In this paper, a review of recent developments on hydrogen storage in MOFs is presented, with a focus on the effects of various factors including open metal sites, ‘guest’ metal ions, ligand functionalization, surface area, pore volume, pore size, and Pt or Pd metal nanoparticles, on hydrogen storage. In addition, the review examines the emerging research on MOF hybrid hydrogen storage systems, primarily in the context of employing MOFs for nanoconfinement of high temperature hydrogen storage materials. The review focuses on experimental studies.