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Nanotechnology in Mg-based hydrogen storage materials

Hydrogen storage is one of the enabling technologies, which may be combined with hydrogen production and fuel cell ones and provide one of the future ultimate carbon-free energy storage solutions, for portable, onboard and stationary applications. Researchers have done studies on Mg-based materials for on board hydrogen storage (for fuel cell vehicles) for decades. From the study of downsizing effect on kinetics and thermodynamics, the author found that hydrogen storage kinetics can be significantly enhanced by nanosize and catalysts, however, desorption thermodynamics (enthalpy and entropy) in nanostructured system does not change with downsizing and catalysis in the size range of 5-300 nm. This means that nanostructured MgH2-Mg system is not suitable for onboard hydrogen storage in which case a working temperature of below 100 degrees is needed. Nevertheless, Mg-based materials show promising properties for stationary energy storage due to the advantages of low cost, high energy density and no need for low working temperature. Some recent results from the author on Mg-based materials focusing on kinetics enhancement, thermodynamics tailor and capacity improvement will be discussed in this work.

Speaker Biography

Huaiyu Shao, currently is a fast-track assistant professor at Institute of Applied Physics and Materials Engineering (IAPME) at University of Macau. Before this position, he was an assistant professor at International Institute for Carbon-Neutral Energy Research (WPI-I^{2}CNER), Kyushu University. His research focuses on development of hydrogen energy materials and fuel cell based technology for energy storage application, especially to store fluctuating renewable powers in order to provide stable energy supply. He got his phd in inorganic chemistry in Peking University, China.

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