INTERNATIONAL JOURNAL OF HYDROGEN ENERGY 36 (2011) 1059–1065

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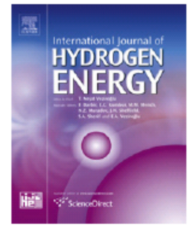


# Rapid hydrogenation at 30 °C of magnesium (Mg) and iron (Fe) nanocomposite obtained through a decomposition of $Mg_2FeH_6$ precursor

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ARTICLE INFO

*Article history:*
Received 16 August 2010
Accepted 30 August 2010
Available online 12 October 2010

*Keywords:*
Ternary $Mg_2FeH_6$ hydride
Dehydrogenation
Magnesium-iron nanocomposite
Microstructure
Hydrogenation at 30 °C

ABSTRACT

A ternary $Mg_2FeH_6$ hydride was synthesized applying the processing route described in detail in [4]. Subsequently, a nanocomposite of 2Mg + Fe was produced through a thermal decomposition of $Mg_2FeH_6$ precursor. Microstructural studies by SEM, STEM, EDS, EELS and XRD show a microstructure consisting of nanocrystalline nearly spherical Fe particles with an average diameter of 20–30 nm uniformly distributed in the nanocrystalline Mg matrix exhibiting the grain size on the order of 5–10 nm. The 2Mg + Fe nanocomposite was subsequently hydrogenated at 30 °C under 4 MPa of hydrogen pressure. After 10 h about 1.1 mass% of hydrogen has been absorbed but the pertinent desorption curve shows that the hydrogenation process is not saturated yet. Temperature programmed desorption (TPD) of hydrogenated 2 Mg + Fe sample shows an asymmetrical desorption peak with a tail extending from ~130 to 200 °C, then sharp increase in the peak height and eventually a sudden drop around a maximum at ~250 °C. This asymmetrical shape strongly suggests that a large population of nanocrystalline grains being in an intimate contact with the nanocrystalline particles of Fe which, most likely, act as a catalyst, is able to desorb hydrogen at very low temperatures from ~130–250 °C under helium flow used in a TPD test.