Desorption temperature characteristic of mg-based hydrides catalyzed by nano-sio2 prepared by high energy ball milling

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Abstrak

Magnesium-based hydrogen storage alloy is one of the most attractive hydrogen storage materials for fuel cell-powered vehicle application. However, a high desorption temperature and slow kinetics limit its practical application. Extensive efforts are required to overcome these problems, one of which is inserting a metal oxide catalyst. In this work, we reported the current progress of using nano-silica (SiO2) as a catalyst to improve the thermodynamics and kinetics of magnesium hydride (MgH2). Nano-SiO2 was extracted from local rice husk ash (RHA) using the co-precipitation method. Then, the MgH2 was catalyzed with a small amount of nano-SiO2 (1 wt%, 3 wt%, and 5 wt%) and prepared using a high-energy milling technique. The microstructure and hydrogen desorption performance were studied using x-ray diffraction (XRD), scanning electron microscopy (SEM), and differential scanning calorimetry (DSC). The results of the XRD test showed that the milling process over 5 h reduced the material to a nanometer scale. Then, SEM images showed that the powders were agglomerated after 5 h of milling. Furthermore, it was also found that nano-SiO2 reduced the hydrogen desorption temperature of MgH2 to 338°C in 14.75 min when the 5 wt% variation of the catalyst was applied.