

Abstract

LiNH₂ and a pre-processed nanoMgH₂ with 1:1 and 2:1 molar ratios were mechanochemically milled in a high-energy planetary ball mill under inert atmosphere, and at room temperature and atmospheric pressure. Based on the thermogravimetric analysis (TGA) experiments, 2LiNH₂-nanoMgH₂ demonstrated superior desorption characteristics when compared to the LiNH₂-nanoMgH₂. The TGA studies also revealed that doping 2LiNH₂-nanoMgH₂ base material with 2 wt. % nanoNi catalyst enhances the sorption kinetics at lower temperatures. Additional investigation of different catalysts showed improved reaction kinetics (weight percentage of H₂ released per minute) of the order TiF₃ > nanoNi > nanoTi > nanoCo > nanoFe > multiwall carbon nanotube (MWCNT), and reduction in the on-set decomposition temperatures of the order nanoCo > TiF₃ > nanoTi > nanoFe > nanoNi > MWCNT for the base material 2LiNH₂- nanoMgH₂. Pristine and catalyst-doped 2LiNH₂-nanoMgH₂ samples were further probed by X-ray diffraction, Fourier transform infrared spectroscopy, transmission and scanning electron microscopies, thermal programmed desorption and pressure-composition-temperature measurements to better understand the improved performance of the catalyst-doped samples, and the results are discussed.

Citation

S Srinivasan, DE Demirocak, Y Goswami & E Stefanakos. Investigation of Catalytic Effects and Compositional Variations in Desorption Characteristics of LiNH₂-nanoMgH₂. Applied Sciences, 2017, 7, 701.