

An Investigation on Hydrogen Absorption/Desorption Properties of Nanostructured TiFe Compound Prepared by High-Energy Ball Milling and Post-Heating

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Abstract:

Hydrogen absorption/desorption properties of nanostructured TiFe compound prepared by high-energy ball milling from TiH₂ and Fe powders mixtures and post-heating under vacuum were investigated in this paper. Samples containing mixtures of TiH₂ and Fe powders were dry-milled in a planetary mill for times ranging from 5 to 40 hours and post-heated under dynamic high-vacuum for synthesis reaction. Amount of hydrogen absorbed/desorbed by samples was determined by automated Sievert's apparatus, under constant hydrogen flow rate of 9mL/min (dynamic measurements). Each sample absorbed hydrogen at 20 bar and room temperature requiring no thermal activation cycles. However, in some cases (40 hours) low kinetics and reversible storage capacity have been observed after a hydrogen cycling (0.31mL/min.g and 0.3 wt% H₂ at 14.1 bar, respectively). Sample milled for 10 hours absorbed hydrogen at lowest pressure (6.2 bar) and highest flow rate (1.26mL/min.g)