

## EASILY HYDRIDABLE NANOSTRUTURED TiFe FROM BALL MILLED TiH<sub>2</sub> AND Fe POWDERS MIXTURES

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This paper describes an alternative method for TiFe compound synthesis using high-energy ball milling. Strong adherence of milled powders and activation procedure for hydrogen uptake were both avoided. Mixtures of TiH<sub>2</sub> and Fe powders were dry-milled in a planetary ball mill at variable time ranging 5 to 40 hours. The amount of sample, number and diameter of the balls were kept constant in all experiments. After milling, samples were heated under dynamic high-vacuum for the synthesis reaction, followed by hydrogen pressurization and cooling. As-milled and heat-treated materials were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) and differential thermal analysis (DTA). PCT measurements were conducted on a Sieverts type apparatus at a constant flow of hydrogen (dynamic mode).

As-milled mixtures presented only Fe and TiH<sub>2</sub> phases. TiH<sub>2</sub> was effective for providing high powder yields due to the low adherence of the powders to the vial and media during milling. Nanocrystalline TiFe compound was obtained only after a heat treatment at 600°C. Samples were prone to absorb hydrogen during cooling near room temperature (35° to 57°C), without long and tedious activation procedures. The best results for hydrogen sorption PCT measurements were obtained with samples milled for 10 hours. Samples milled at 25 and 40 h presented some oxidation that could be deleterious for hydrogen sorption.

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