EFFECTS OF $NaBH_4$ ADDITIONS ON HYDROGEN ABSORPTION BY NANOSTRUCTURED FeTi POWDERS

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Abstract

Hydrogen is nowadays considered as one of the most promising fuels for the future transportation market, since it is highly energetic and its combustion products are non-toxic. There are however some inherent problems related to its handling and storage that makes its implementation difficult in the energy market [1].
One way of storing hydrogen is in form of intermetallic hydrides. Some intermetallics can store large amounts of hydrogen in their interstitial sites and, in some cases, reversible equilibrium absorption/desorption cycles might be realized near ambient temperature and normal pressure.
FeTi is an intermetallic compound that is being widely studied for hydrogen storage purposes. This system has one of the highest volumetric storage capacities and can be produced at low cost [2,3]. However, the FeTi alloy prepared through conventional metallurgical process requires activation treatments at elevated temperature. It has been shown previously that the nanostructured FeTi can be activated at room temperature with the mechanical alloying of pure metallic constituents, Fe and Ti, with $NaBH_4$ [4].
In this work nanostructured FeTi based powders were produced by mechanical alloying, and the effects of adding different amounts of $NaBH_4$ on the hydrogen absorption capacity and on the agglomeration of the powders were studied. The effect of handling powders in a glovebox with oxygen free atmosphere or in atmospheric ambient condition was also examined. Several parameters of the as-milled powders were controlled. Among the characterization performed are phase identification and crystallite size determinations by X-ray diffraction, micro hardness measurements, scanning electron microscopy and absorption isotherms determinations.

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