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Microstructure and hydrogen storage properties of FeTi + x wt% Hf alloys (x = 0, 2, 4 and 8)

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In the perspective of widespread utilization of hydrogen, safe and low cost ways to store hydrogen are needed. Two common ways to store hydrogen are in the liquid and gaseous forms. However, both of these technique present serious drawbacks for many practical applications because they necessitate either a very low temperature (20 K) or a high pressure (700 bar). Another way to store hydrogen is to use metal hydrides. In metal hydride the hydrogen is chemically bonded to metal atoms. Metal hydrides are a safe and compact way to store hydrogen but, in order to be widely used by the industry, the cost should be reduced. A big part of the cost of FeTi is the first hydrogenation (activation) which has to be performed at high temperature and pressure. In order to reduce the activation time and conditions of operation, we investigated the addition of hafnium to FeTi. Alloys of compositions FeTi + x wt% Hf , with x=0, 2, 4 and 8 were synthesized using an induction furnace. The microstructure of the as-cast alloys were investigated by scanning electron microscopy and electron microprobe analysis. We found that the alloys are multiphase: one phase corresponding to the matrix FeTi, with about 1 at% of Hf irrespective of the amount of doping. Another phase is hafnium-rich of approximate composition Ti1.1Fe0.74Hf0.16. The effect of Hf doping on activation kinetics will be reported and possible mechanism discussed.

Author: RAZAFINDRAMANANA, VOLATIANA

Co-authors: HUOT, Jacques (UQTR); Prof. BOBET, Jean-Louis (ICMCB, France)

Presenter: RAZAFINDRAMANANA, VOLATIANA

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