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Hydrogen storage properties of TiFe + Zr alloys

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Economic and environmental considerations are pushing the society to replace oil by renewable energies. In this perspective, hydrogen is considered to be a good candidate as an energy vector for mobile and stationary applications. The conventional ways to store hydrogen are in the liquid form at very low temperature or in gaseous state in high pressure tanks. However, these two techniques have serious limitations due to the low temperature and high pressure involved. There is thus the need to develop other means of hydrogen storage. One good candidate is metal hydride where the hydrogen is chemically bonded to metal atoms.In metal hydrides the hydrogen could be stored in a compact way at low temperature and pressure thus making this technique particularly safe. However, in order to be used commercially, the cost of metal hydrides has to be reduced. The aim of this study is to understand the comparative effect of Zr and V on hydrogenation characteristics of TiFe alloy, using industrial grade Fe (ASTM 10005) and Ti (ASTM B265 grade 1) as a raw material. Materials were synthesized by arc melting and studied without further heat treatments. X-ray diffraction patterns were taken to find out the crystal structures of pure TiFe and doped TiFe alloys. Morphology and compositional analysis were studied by Scanning electron microscopy (SEM) image and energy dispersive x-ray spectroscopy (EDX).We found that TiFe alloy doped with 4 wt% of Zr leads to a remarkable improvement of the first hydrogenation behavior of TiFe alloy.

Author: Mr PATEL, Abhishek Kumar (UQTR)

Co-author: Prof. HUOT, Jacques (UQTR)

Presenter: Mr PATEL, Abhishek Kumar (UQTR)

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