

Mg-based composites for hydrogen storage

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Magnesium hydride can be already considered as the traditional hydrogen storage material despite some unanswered fundamental questions concerning its properties. These questions concern the understanding of the activation (or first hydrogen absorption) step, the role of the additives in the absorption / desorption kinetics and the synergy between phases in the absorption / desorption kinetics, in the case of composites systems.

Recent results indicated that modifications of conventional processing routes to synthesize hydride-forming systems might have a strong role in the hydrogen storage behavior of different metals and compounds. The present work shows results of Mg-TiFe and Mg-LaNi₅ composites that have been produced by new approaches of the usual techniques, such as high-energy ball milling (HEBM) and cold rolling (CR) under inert atmosphere. Structural characterization was carried out by X-ray diffraction (XRD) and scanning and transmission electron microscopy (SEM and TEM). H-absorption / desorption kinetics were measured in a Sievert's-type apparatus and by differential scanning calorimetry (DSC) coupled with thermogravimetric analysis (TGA) and mass spectrometry (QMS).

MgH₂ hydride was formed at room temperature in Mg-TiFe composites produced by HEBM, in this case with an important improvement in the hydrogen absorption kinetic as compared with pure Mg. MgH₂-LaNi₅ composites were prepared by cold rolling under an inert atmosphere and the composite presented faster hydrogen absorption/desorption kinetics and reduced desorption temperatures in comparison to MgH₂. These results are discussed in view of the above fundamental questions, in particular considering the possible synergy between Mg and the second phase (TiFe or LaNi₅) in the modification of absorption and

desorption kinetics.