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NANOSTRUCTURED MAGNESIUM HYDRIDE PREPARED BY COLD ROLLING AND COLD FORGING

Daniel Leiva[1]
Jacques Huot[2]
Alberto Jorge[1]
Tomaz Ishikawa[1]
Walter Botta[1]

Abstract

Magnesium is a promising material for solid state hydrogen storage, since it has low cost and its hydride can store reversibly up to 7.6 wt. % of hydrogen. Fast H-sorption kinetics at around 300°C can be achieved after processing Mg-based mixtures by high-energy ball milling (HEBM), which produces nanostructured composite powders. Severe plastic deformation (SPD) techniques are being explored as an alternative to HEBM in order to obtain more air-resistant materials and reduce processing times. In this work, Mg, MgH2 and MgH2-Fe mixtures were severely mechanically processed by extensive cold forging and cold rolling. A very significant grain refinement (to around 10 nm) was achieved using MgH2 instead of Mg as raw material. Enhanced H-sorption kinetics properties were observed for these mechanically processed MgH2-based nanocomposites. These results are promising since it reveals the potential of using low cost mechanical processing routes to produce Mg-based nanomaterials for hydrogen storage.

[1] *Universidade Federal de São Carlos.*
[2] *Université du Québec à Trois-Rivières.*