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P15 - Mechanochemical activation of LiAlH₄-Fe₂O₃ composites-a method to enhance kinetics of hydrogen desorption

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Mechanical milling of pure lithium alanate (LiAlH₄) was done with addition of 5 weigh percent of Fe₂O₃ using different milling time ranging from 1 to 15 minutes [1]. Mechanical milling of composites causes destabilization of LiAlH₄ structure as it observed by XRD measurements. Particle size distribution results reveals that composite particle size decrease with milling time up to 3 minutes, and then increase almost to the original size, for 15 min sample. Mechanical mailing cause phase transformation from AlH₄⁻ to AlH₆³⁻. As a consequence of structural and chemical changes, desorption properties of composites are change kinetic of desorption is improved in comparison to unmilled LiAlH₄. The shifting of hydrogen desorption temperature to lower temperatures is observed together with change from multi-step desorption to one-step hydrogen desorption is also observed. This caused decrease in activation energy of composites from E_a = 665 kJ/mol for unmilled LiAlH₄, E_a = 279 kJ/mol for 3 min milled composite.

[1] M.Dragojlović, I.Milanović, A.Gradišek, S.Kurko, M.Mitrić, A.Umićević, J.Radaković, K.Batalović, *Int. J. Hydrog. Energy* **46** (2013) 13070.