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Mechanically Activated Reactive Sintering of Mg-Ni-Fe System Hydride

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ABSTRACT

This paper examines reactive sintering of Mg_2FeH_6 and $Mg_2Ni_{1-x}Fe_x$ hydrides combined with ball milling. This study aimed at improving the Mg_2FeH_6 productivity and examining the effect of the addition of nickel to the hydrogen storage properties of Mg_2FeH_6 hydride. Before sintering metallic hydrides, the raw materials of metallic powders were mechanically activated by a high-energy ball mill. As a result, the ball-milled 2Mg + Fe recorded as much as 5 mass% in hydrogen storage capacity during heat treatment, and the final product successfully indicated a high purity Mg_2FeH_6. Interestingly, the dehydrogenation enthalpies of the $Mg_2Ni_{1-x}Fe_x$ hydrides were larger by 10% or more than Mg_2NiH_4 and Mg_2FeH_6, taken individually. This was collateral evidence that the mechanically activated reactive sintering of Mg_2FeH_6 and $Mg_2Ni_{1-x}Fe_x$ hydrides produced a new structure of the Mg-Ni-Fe-H system due to the synergy effect.