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Enhancement of a chemical hydrogen storage system by a catalyst

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Hydrogen is one of innovative fuels which storage is a challenge so far. One of options is hydrogen storage in complex-hydride systems, where it is chemically bonded unless a sufficient heating is applied. Main virtues of a hydrogen storage system are: storage capacity, safety of use, reversibility, fast reaction rate and a moderate operation temperature. Amide-hydride mixtures, where NH3-emission into the environment is prevented by hydrides, are considered attractive hydrogen storage systems. Their another advantage is weight hydrogen storage density if alkaline or alkaline earth metals are used. 6Mg(NH2)2:9LiH ("69") requires 500K to emit 5.2 wt.% H2 and about an hour to get fully dehydrogenated. However, when LiBH4 is admixed ("69x", where x is LiBH4 quantity), the re/desorption rates are reported to enhance by a factor of 3. This is explained by formation of a Li-ion and proton conductive substance at operation temperatures: LiNH2–LiBH4, where LiNH2 is the first product of the reaction between Mg(NH2)2 and LiH. Dehydrogenation rates increase along with the amount of LiBH4. That leads to the hypothesis that different mixed phases appear in the course of operation depending on the amount of LiBH4. The behaviour of different LiNH2–LiBH4 ratios under heating has been examined resulting in a phase diagram of this system. A juxtaposition of various 69x systems with systems LiNH2–LiBH4 is planned after revealing their micro-structures by means of total scattering measurements.

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