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Borohydrides as Energy Storage Materials

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The conversion and storage of energy is becoming increasingly important. Finite reserves of fossil energy carriers and growing environmental concerns are leading to an increased use of so-called renewable energy sources such as solar or wind energy. A future society therefore requires materials to convert energy fluxes to energy carriers for the convenient storage and transport of energy. Lightweight borohydrides such as LiBH_4 combine high volumetric (43MJ/l) and high gravimetric (65MJ/kg) energy densities and have been therefore discussed as hydrogen storage materials or rocket fuels. Due to their high ion conductivity at high temperatures borohydrides and borohydride based materials are also considered as solid state electrolyte for batteries and fuel cells.

We present the synthesis of lightweight complex hydrides and their hydrogen release reactions. We introduce strategies to tune the desorption temperature and to enable reversibility at near ambient conditions. On the example of LiBH_4 , we discuss the origin of the ion conductivity and the effect of imposed disorder either by halide additives or by nano-confinement.

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