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Our research group focus on material conversion techniques such as hydrogen production, hydrogen storage, and nitride synthesis by chemical reactions using light elements such as lithium (Li), sodium (Na), and magnesium (Mg). To understand essential properties of the above materials, all the synthesis and analyses process can be performed without exposing materials into air by using glove box and special experimental systems. The representative works are introduced below.

Magnesium hydride (MgH_2) is attractive hydrogen storage material because of its high gravimetric hydrogenation capacity, 7.6 wt.%. However, the improvement of reaction kinetics for hydrogen absorption and desorption required. To operate the reactions, higher temperature than 300 °C is generally required as thermal activation. Niobium oxide (Nb_2O_5) is an excellent catalyst to drastically improve the reaction kinetics of Mg[1, 2)]. However, the detailed mechanism is not understood yet. Recently, research on the catalytic mechanism of functional oxides such as Nb_2O_5 proceeds as collaboration work in “Center for Functional Nano Oxide” in Hiroshima University, and novel knowledges are obtained.

In addition to the above research, thermochemical hydrogen production via chemical reactions based on redox reactions of sodium (Na/NaO_x)[3)] and nitride synthesis by pseudo catalytic process based on the reactions of lithium (Li) alloys[4)].

Reference

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