

Experimental study of LaNiSn alloy as a perspective hydrogen storage material

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Hydrogen has a promising perspective as an energy carrier with the potential to be a clean and efficient energy source in various applications. One possible promising material for energy storage is the LaNi alloy-based material. This material is capable of forming hydrides at ambient temperatures and relatively low pressures with fast sorption kinetics. Ternary phase diagram of the system La-Ni-Sn was studied at temperatures of 300 and 600°C in the entire concentration range. Ten stable ternary phases were found at 300°C, where three ternary phases have unknown structure. Detailed study of the crystallographic structure of these phases is a next planned step. The solubility of tin in the LaNi₅ phase is complex at lower temperatures and a miscibility gap region is formed. It is known, that at least two types of promising hydrides (H₃La₁Ni_{4.95}Sn_{1.05} and LaNiSnH₂) exist in the ternary system La-Ni-Sn.

As the next step, the reactivity with hydrogen and the kinetics of hydrogen sorption and desorption were studied for selected samples. The powdered alloys react with hydrogen under appropriate (p,T) conditions. Reaction temperature and pressure p_{eq} will be estimated from the p - c - T curves measured at different temperatures. The shape of the p - c - T curves will be used to determine the isothermal phase boundaries.