Thermodynamic Studies of $LaNi_{5-x}Sn_x$ - H from $x = 0.1$ to 0.5 using Isotherms and Reaction Calorimetry.

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The $LaNi_{4.8}Sn_{0.2}$ – H system appears to have desirable hydrogen storage properties, i.e., it has a small hysteresis, a relatively large storage capacity and stability towards disproportionation. For these reasons, it is of interest to make a careful thermodynamic study of the intermetallic compound - hydrogen system with different tin contents. A series of $LaNi_{5-x}Sn_x$ intermetallic compounds were prepared by H.C.I. which were all single phase, high purity samples. Isotherms have been measured for $x = 0.10, 0.20, 0.25, 0.32, 0.40$ and 0.50 from 300 to 423 K. The plateau pressures were found to progressively decrease with increase of x. The magnitudes of the enthalpy for the plateau reaction, $|\Delta H_{plat}|$, were determined from the van't Hoff plots for both the plateau pressure for hydride formation, p_f, and for decomposition, p_d. The magnitudes of the enthalpies increase steadily with increase of x while the entropy of the plateau reaction is nearly constant. Thus the observed decrease in the plateau pressures can be attributed to the changes of ΔH_{plat} with x. The extent of the two-phase plateau region decreases with increase of x and the hysteresis also decreases with increasing x and it nearly vanishes at $x = 0.5$.

Enthalpies for reaction were determined both from van 't Hoff plots and from reaction calorimetry at 298 k'. Generally the agreement was good between the two methods of obtaining ΔH_{plat} values.