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Hydrogen Desorption Behavior of Nickel-Chloride-Catalyzed Stoichiometric $Li_4BN_3H_{10}$ FREDERICK PINKERTON, MARTIN MEYER, General Motors R&D Center — Li-B-N-H quaternary hydrides with the α-phase crystal structure form over a range of compositions between $Li_3BN_2H_8$ and $Li_4BN_3H_{10}$ and have up to 11.9 wt% hydrogen capacity. Previous work focused on the non-equilibrium $Li_3BN_2H_8$ composition created by ball milling because it has maximum hydrogen release and minimum NH_3 co-generation. Here we report the hydrogen and NH_3 release characteristics of α-phase material having the equilibrium $Li_4BN_3H_{10}$ composition. In the absence of a dehydrogenation catalyst, H_2 and NH_3 were released simultaneously in roughly equal quantities by weight (or about 10% NH_3 by volume) at temperatures above 240 $^\circ$C. Adding Ni in the form of $NiCl_2$ as a dehydrogenation catalyst reduced the H_2 release temperature by 122 $^\circ$C. NH_3 release, in contrast, still occurred only at the higher temperature. As a result, decomposition occurred in two steps separated in temperature, dominated by H_2 gas at low temperature and NH_3 at high temperature. The two gases clearly evolved in two distinct reactions that are coincident in uncatalyzed $Li_4BN_3H_{10}$, but can be separated by a dehydrogenation catalyst. We expect that NH_3 co-generation could be completely eliminated at sufficiently low dehydrogenation temperatures.

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