New Quaternary Hydride Li$_3$BN$_2$H$_8$ with >10 wt% Hydrogen: II. Hydrogen Desorption Measurements
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— We report thermogravimetric, volumetric, and calorimetric measurements of hydrogen desorption from the new quaternary hydride Li$_3$BN$_2$H$_8$ (11.9 wt% theoretical hydrogen capacity). Li$_3$BN$_2$H$_8$ releases $\geq$10 wt% hydrogen at temperatures above $\sim$250$^\circ$C. Simultaneous mass spectrometry residual gas analysis shows that a small amount of ammonia (2-3 mole% of the generated gas) is released concurrently. Independent volumetric and gravimetric measurements are in excellent agreement regarding the quantities of hydrogen and ammonia released. Differential scanning calorimetry and in-situ x-ray diffraction show that Li$_3$BN$_2$H$_8$ melts at $\sim$190$^\circ$C, thus hydrogen evolution occurs from the molten state. It dehydrides to the solid product Li$_3$BN$_2$, and the evolved gas satisfactorily accounts for all of the available hydrogen content. Preliminary calorimetric measurements suggest that hydrogen release is exothermic, and, hence, not easily reversible; to date, rehydriding has not been achieved.

Date submitted: 30 Nov 2004

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