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New Quaternary Hydride $Li_3BN_2H_8$ with >10 wt% Hydrogen: I. Material Synthesis and Structural Characterization GREGORY P. MEISNER, FREDERICK E. PINKERTON, MARTIN S. MEYER, MICHAEL P. BALOGH, General Motors Research and Development Center, MATTHEW KUNDRAT, Aerotek Corp. — We report a new quaternary hydride $Li_3BN_2H_8$ synthesized from mixed $LiNH_2$ and $LiBH_4$ powders in a 2:1 molar ratio by ball milling. X-ray diffraction (XRD) results show that as milling time increases, the $LiNH_2$ and $LiBH_4$ diffraction peaks weaken and a new set of peaks emerges. At 40 min, the sample is substantially converted to the new phase, with only a small remnant of $LiNH_2$ in the XRD pattern. After 300 min the conversion is complete, and continued milling up to 960 min produces no further change. The final XRD pattern appears to be single phase, except for a small amount of Li_2O impurity, and has a background intensity that is essentially unchanged with milling time, implying that ball milling does not produce an amorphous phase. All of the observed XRD peaks can be indexed as a single BCC quaternary phase with a =10.76 Å. Our *in-situ* XRD data show that $Li_3BN_2H_8$ forms when mixed $LiNH_2$ and $LiBH_4$ powders are heated to above ∼95°C without ball milling, then melts at ∼190°C, and finally forms a mixture of solid Li_3BN_2 polymorphs upon H_2 gas release above ∼250°C.

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