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Thermochemical Investigations of Nano-phase Ammonia Borane: Effect of Higher Loading ABHI KARKAMKAR, Pacific Northwest National Laboratory, ASHLEY STOWE, TOM AUTREY — Chemical hydrogen storage materials that release H_2 by thermolysis without generating CO_2 offer an attractive option. The ammonia borane is an attractive compound containing more than 18 wt% hydrogen. However, the kinetics of hydrogen release in not favorable in bulk materials where H_2 is released at 114 °C. We recently reported use of SBA-15 as scaffold material to form a nanophase ammonia borane species which liberated H_2 at significantly lower temperatures. Hydrogen formation from bulk AB is slightly exothermic (-5 kcal/mol). The reaction enthalpy (ΔH) for release of H_2 from AB adsorbed into SBA-15 (1:1 w/w) was determined to be nearly thermoneutral—dramatically lower than the bulk material. A near thermoneutral reaction suggests that there would be less restrictive heat management issues, greater thermal stability and potentially a lower energy input requirement for regeneration of AB. One drawback which results for nano-phase AB is that while the hydrogen release properties are enhanced, the gravimetric hydrogen density is reduced by a 50% for the 1 to 1 by mass ratio material. We here report on our efforts to increase the gravimetric hydrogen density of nano-phase AB by developing higher loading conditions of AB adsorbed into mesoporous silica (MCM-41).

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