## **Supporting Information**

Platinum Nanoparticle Functionalized CNTs as Nanoscaffolds and Catalysts to Enhance the Dehydrogenation of Ammonia-Borane

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**Figure S1.**  $NH_3$  coordinated with AB upon the time under 1.5 bar  $NH_3$  at 0 °C. A maximum of 1.7 mol  $NH_3$  is coordinated with per mol AB within 70 min.



**Figure S2.** Photos of AB, liquid  $AB \cdot xNH_3$  and the liquid  $AB \cdot xNH_3$  exposed to air for various time at room temperature. After filling 1 bar of ammonia in the AB at 0 °C, a liquid  $AB \cdot xNH_3$  was formed immediately. Exposure of the liquid  $AB \cdot xNH_3$  to air at room temperature for 30 min results in the reformed AB powder.



Figure S3. EDS spectra of Pt@CNTs. It gives a Pt content of 10 wt.%.



FigureS4. BET results about the pore size distributions for Pt@CNTs and loaded AB/Pt@CNTs. The inset shows the corresponding  $N_2$  absorption-desorption isotherms at -196 °C.



**FigureS5**. Volumetric release for quantitative measurements of gas evolution from the pristine AB and the ball-milled AB. The heating rate is 5  $^{\circ}$ C min<sup>-1</sup>.

The weight loss of the ball-milled AB is 57.3 wt.% (The weight loss was calculated by (initial weight of AB – terminated weight) / initial weight of AB.), which is comparable with that of the pristine AB 60.2 wt.% in Figure 3(b). This result confirms that ball milling has little improvement on depressing the emission of the poisonous by-product borazine.



Figure S6. Volumetric release for quantitative measurements of gas evolution from the pristine AB and the ball-milled AB with 1 mol% PtCl<sub>2</sub>. The heating rate is 5 °C min<sup>-1</sup>. For calculation of gas release, PtCl<sub>2</sub> is excluded from the composites.



**Figure S7**. Volumetric release for quantitative measurements of gas evolution from the pristine AB, ball milled AB/CNTs, ball milled AB/Pt@CNTs and loaded AB/Pt@CNTs. The heating rate is 5 °C min<sup>-1</sup>. For calculation of gas release, Pt/CNTs is excluded from the composites.



**Figure S8**. Volumetric release for quantitative measurements of gas evolution from the loaded samples with mass ratios (AB: Pt/CNTs) of 5:1, 2:1, 1:1 and 1:2, respectively. The heating rate is 5  $^{\circ}$ C min<sup>-1</sup>. These samples were directly prepared by the "ammonia-deliquescence" method without a pretreatment of ball milling. For calculation of gas release, Pt/CNTs is excluded from the composites.



**Figure S9**. Dependence of hydrogen purity with the Pt@CNTs content in the loaded AB/Pt@CNTs samples.



Figure S10. SEM image of the loaded AB/Pt@CNTs with a mass ratio of 5:1.