

## Supporting Information

### **Fe<sub>3</sub>O<sub>4</sub> nanoclusters highly dispersed on porous graphene support as an additive for improving the hydrogen storage properties of LiBH<sub>4</sub>**

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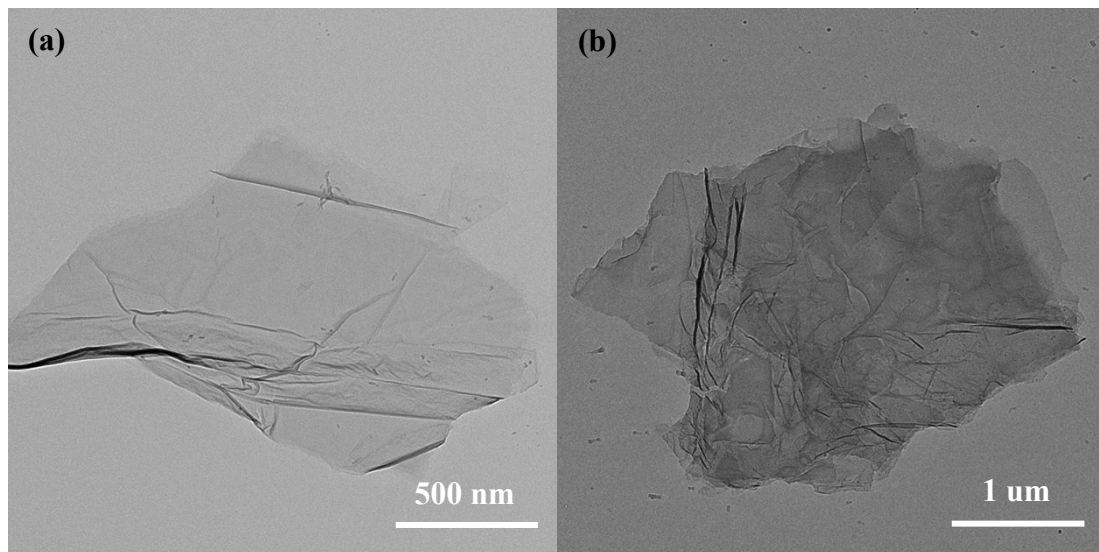
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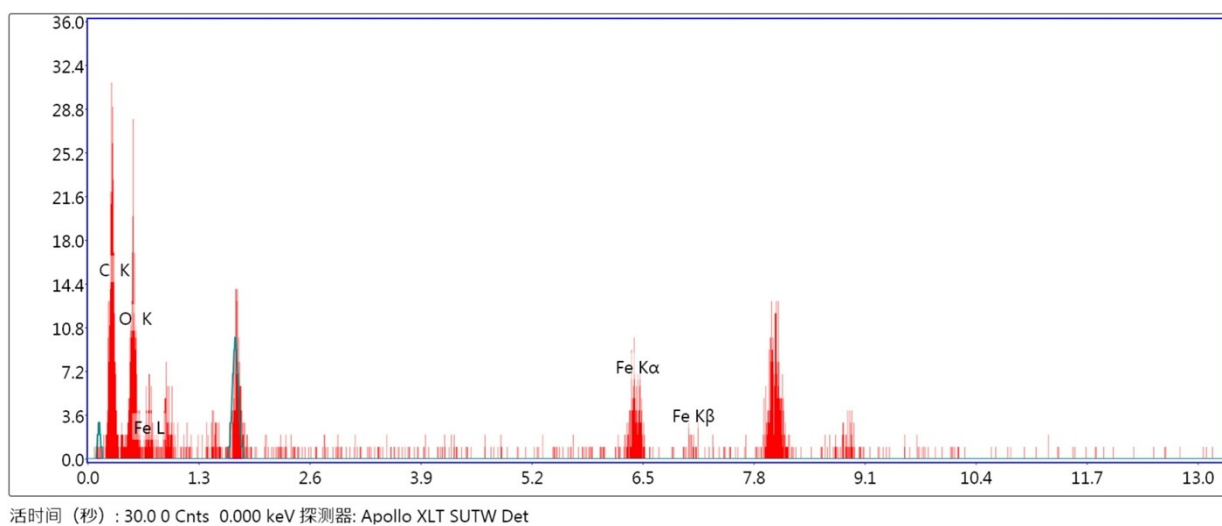
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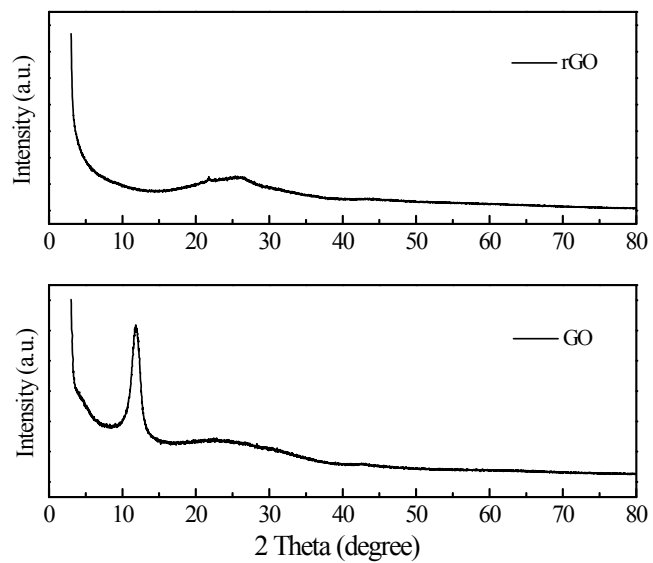


**Figure S1.** TEM images of the (a) GO and (b) rGO.

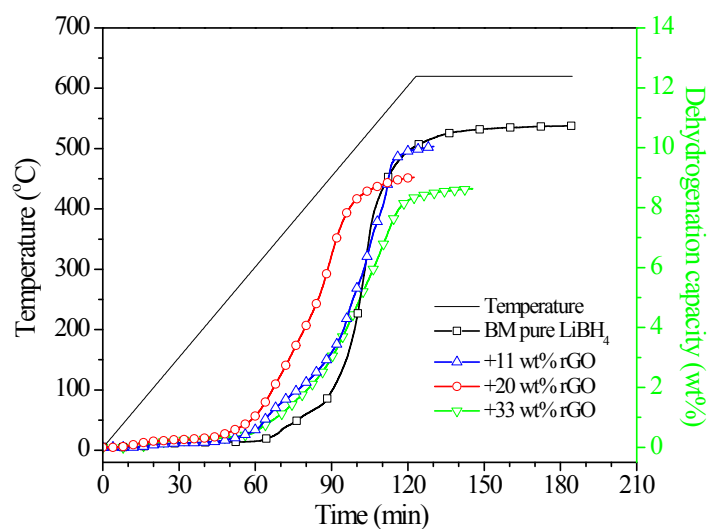


元素	重量%	原子%	净强度	Error %
C K	54.14	69.56	11.8	5.95
O K	25.82	24.9	8.39	8.04
Fe K	20.04	5.54	5.56	7.02

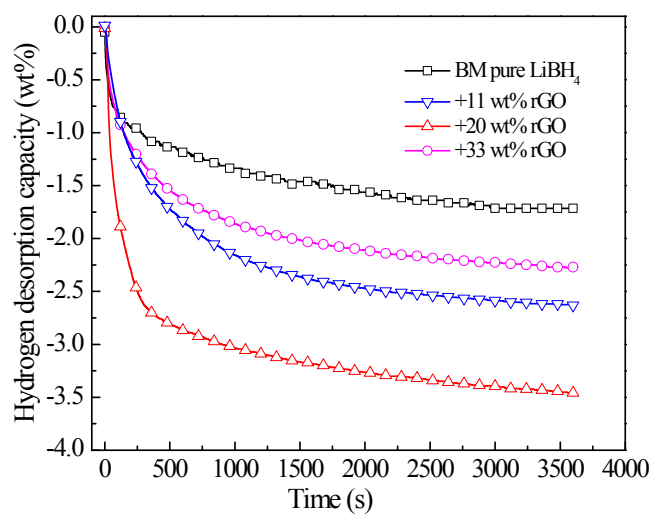
**Figure S2.** EDS image of the as-prepared  $\text{Fe}_3\text{O}_4$ @rGO nanohybrid.



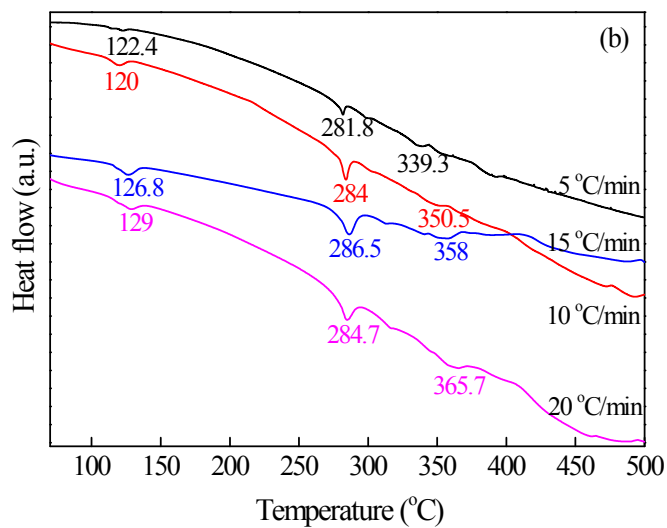
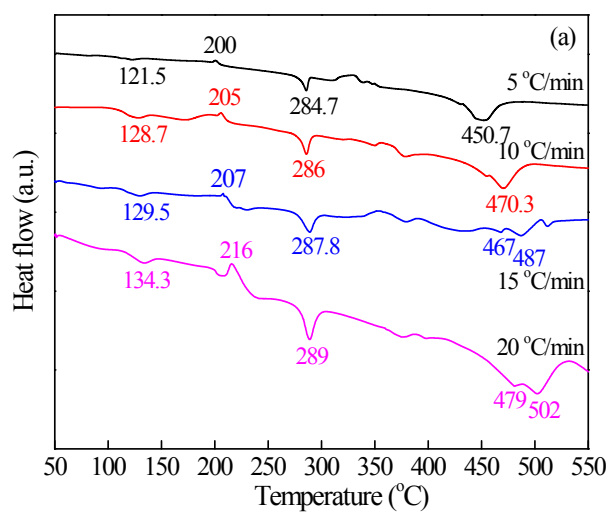
**Figure S3.** XRD patterns of the GO and rGO.



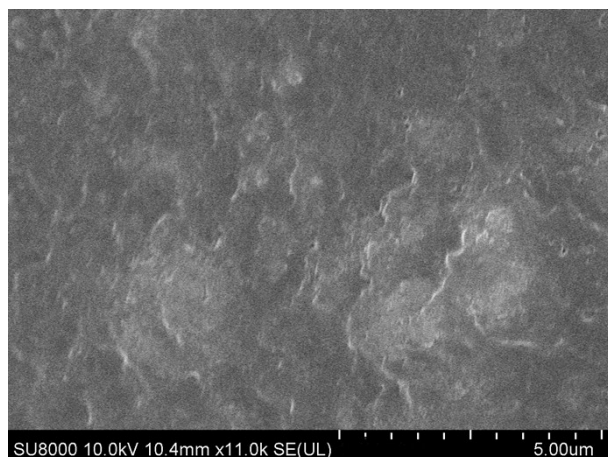
**Figure S4.** TPD dehydrogenation curves of the as-milled  $\text{LiBH}_4$ -x wt% rGO composites (x= 0, 11, 20 and 33).



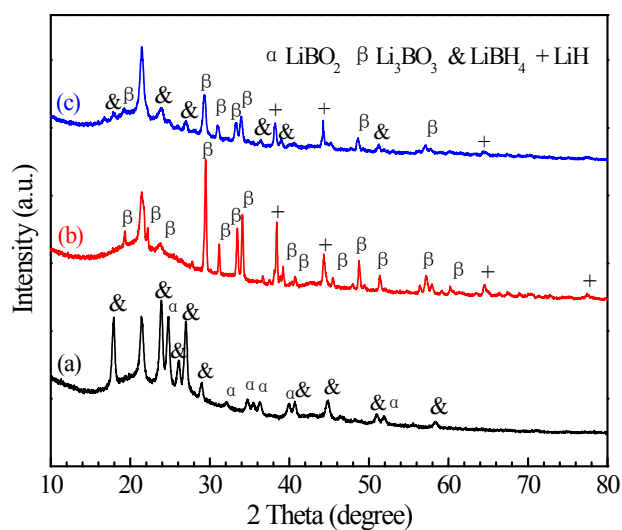
**Figure S5.** Isothermal hydrogen desorption profiles of the as-milled  $\text{LiBH}_4$  with and without rGO composites at 400 °C.



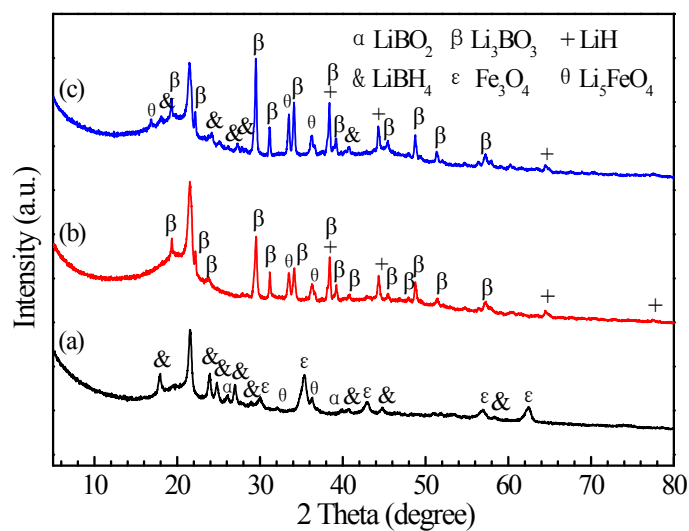
**Figure S6.** DSC profiles of the as-milled (a) LiBH<sub>4</sub>-20 wt% Fe<sub>3</sub>O<sub>4</sub> and (b) LiBH<sub>4</sub>-20 wt% rGO composites at different heating rates.



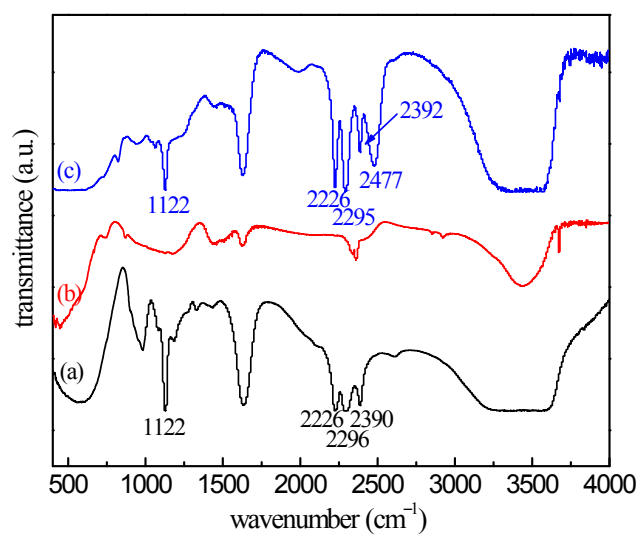
**Figure S7.** SEM image of the LiBH<sub>4</sub>-20 wt% Fe<sub>3</sub>O<sub>4</sub>@rGO composite after first hydrogen desorption at 400 °C.



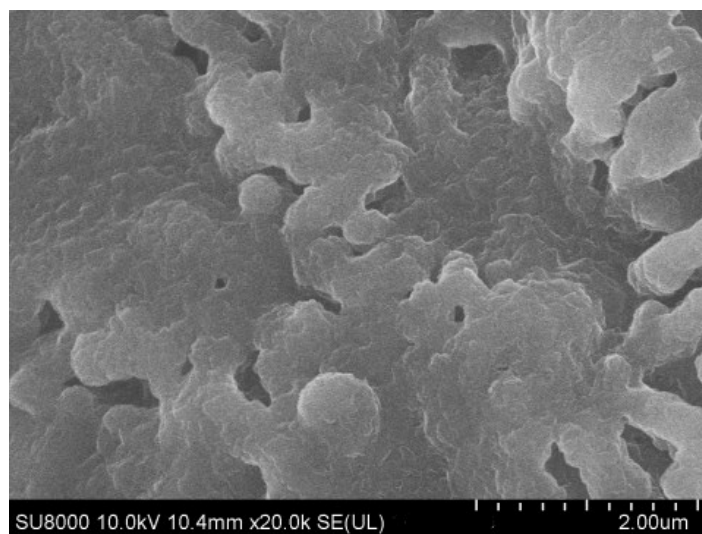
**Figure S8.** XRD patterns of the  $\text{LiBH}_4$ -20 wt% rGO composite at different states: (a) ball-milled; (b) dehydrogenated and (c) rehydrogenated at 400 °C.



**Figure S9.** XRD patterns of the  $\text{LiBH}_4$ -20 wt%  $\text{Fe}_3\text{O}_4$  composite at different states: (a) ball-milled; (b) dehydrogenated and (c) rehydrogenated at 400 °C.



**Figure S10.** FTIR spectra of the  $\text{LiBH}_4$ -20 wt% rGO composite at different states: (a) ball-milled; (b) dehydrogenated and (c) rehydrogenated at 400 °C.



**Figure S11.** SEM image of the  $\text{LiBH}_4$ -20 wt%  $\text{Fe}_3\text{O}_4$ @rGO composite after first hydrogen absorption at 400 °C.