Electronic Supplementary Information (ESI)

Facile hydrothermal synthesis of $SnCoS_4$/graphene composites with excellent electrochemical performances for reversible lithium ion storage

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TGA was carried out to quantify the composition of SnS_2/GNS, CoS_2/GNS and $SnCoS_4$/GNS composites. As shown in Fig. S1(a), TGA curve of SnS_2/GNS exhibits three regions of weight loss in the air atmosphere. The initial weight loss below 200 °C is due to the evaporation of adsorbed water in the composite.[1,2] The second weight loss between 200 °C to 425 °C is attributed to the transformation from SnS_2 to SnO_2[1] and oxidation of oxygen-contained functional group of reduced graphene oxide.[3,4] The third weight loss in the temperature ranging from 430 °C to 600 °C is assigned to the removal of graphene.[1,3] Thus, the remaining residue is SnO_2 for SnS_2/GNS composite. As shown in Fig. S1(b), there are several stages of weight loss for CoS_2/GNS, which is similar to that of CoS_2/carbon nanotubes and CoS_2/graphene nanocomposite reported elsewhere.[5,6] Those several weight losses for CoS_2/GNS in the air atmosphere should include the evaporation of adsorbed water, oxidation of oxygen-contained functional group, reduced graphene oxide and CoS_2. According to the literatures,[5,6] the weight loss from 600 °C to 800 °C should be ascribed to the oxidation of CoS_2 to Co_3O_4. Thus, the remaining residue should be Co_3O_4 for CoS_2/GNS composites. Fig. S1(c) shows that the TGA curve of $SnCoS_4$/GNS composite also displays several regions of weight loss in the air atmosphere. According to the literatures,[1,5,6] SnS_2 and CoS_2 should be transferred to SnO_2 and Co_3O_4 over 800°C, respectively. The reduced graphene oxide (or graphene) also should be completely oxidized to CO_2 over 800 °C.[3-5] Therefore, the

remaining residue was SnO_2 and Co_3O_4 for $SnCoS_4$/GNS composite.

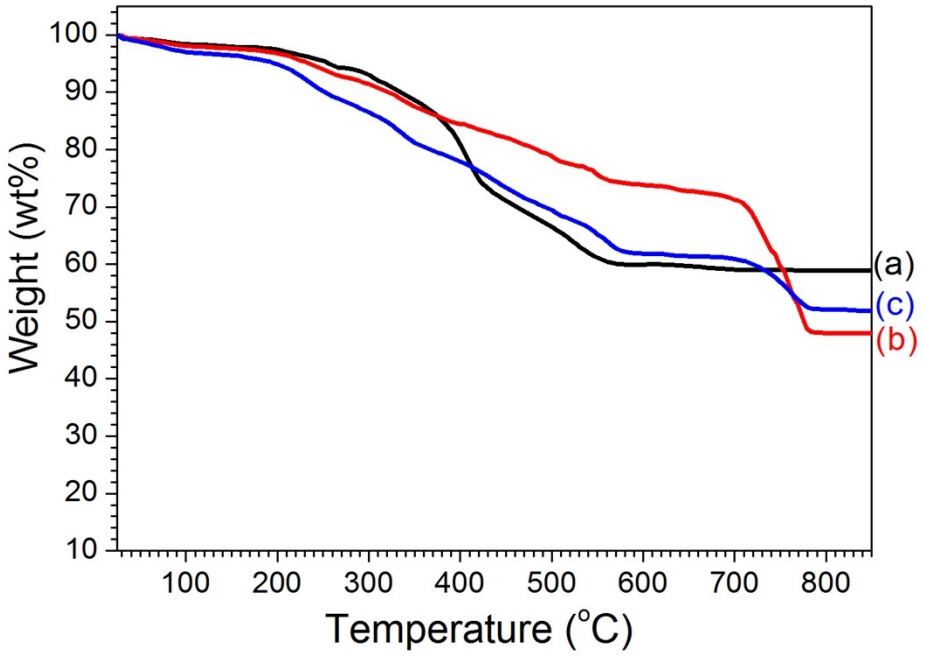

Fig. S1. The TGA curves of (a) SnS_2/GNS, (b) CoS_2/GNS and (c) $SnCoS_4$/GNS.

Based on the above investigations, the remaining residue should be SnO_2 for SnS_2/GNS composites, Co_3O_4 for CoS_2/GNS composites, SnO_2 and Co_3O_4 for $SnCoS_4$/GNS composite. Therefore, the SnS_2 and graphene content of SnS_2/GNS composite can be calculated to be 74.6 wt% and 25.4 wt%, respectively. The CoS_2 and graphene content of CoS_2/GNS composite can be calculated to be 75.8 wt% and 24.2 wt%, respectively. The $SnCoS_4$ and graphene content of $SnCoS_4$/GNS composite can be calculated to be 72.7 wt% and 27.3 wt%, respectively.

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