Electronic Supplementary Material (ESI) for RSC Advances
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Supplementary information

Facile one-pot synthesis of ultrathin NiS nanosheets anchored on graphene and the improved electrochemical Li-storage properties

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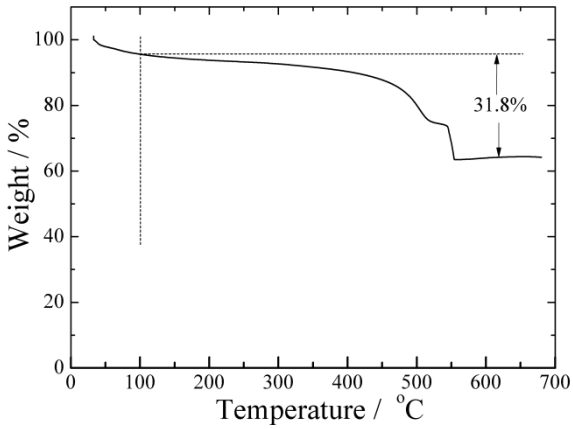

Fig. S1 TG plot of the NiS/G hybrid.

In the above figure, the mass loss below 100 ºC is due to the loss of adsorbed water.[1] The gradual mass loss appears between 100 and 500 ºC is related to the decomposition of the residual oxygen-containing groups.[2,3] This part of mass loss is less significant compared with that in GO,[4] indicating that most of the oxygen-containing groups have been removed during the hydrothermal process.[5] The weight loss starting at around 500 ºC is attributed to carbon oxidation, i.e., the combustion of the carbon skeleton in the reduced GO sheets.[2,3]

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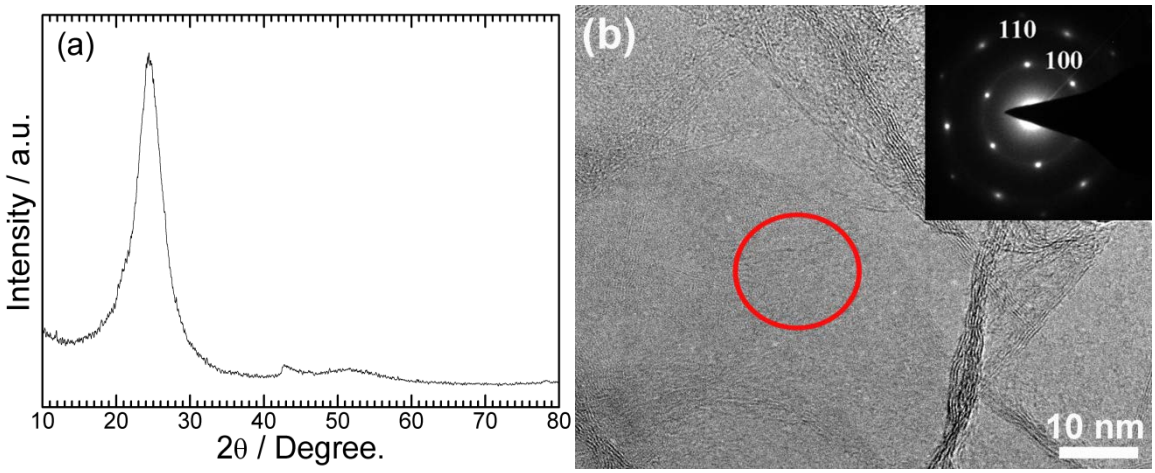

Fig. S2 (a) XRD and (b) HRTEM and the corresponding SAED of bare graphene.

In the above figure, the bare graphene was characterized by XRD (Fig. S2a) and SAED (Fig. S2b). The XRD result confirms the crystalline nature of graphene even though it still has some residual oxygen-containing groups after the chemical reduction. The broadening of the peak compared with natural graphite is possibly due to the short-range ordering and/or small size of the graphene sheets. The well-defined diffraction pattern of the flat plane of graphene (marked by red circle) further verifies the short-range ordering of the graphene sheets.

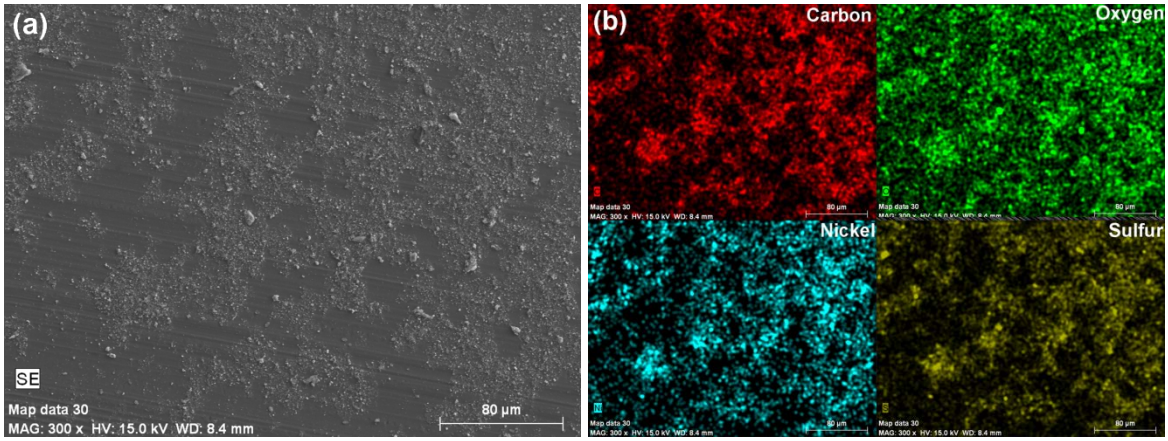

Fig. S3 (a) SEM of NiS/G at low magnification and (b) the corresponding EDS mapping.

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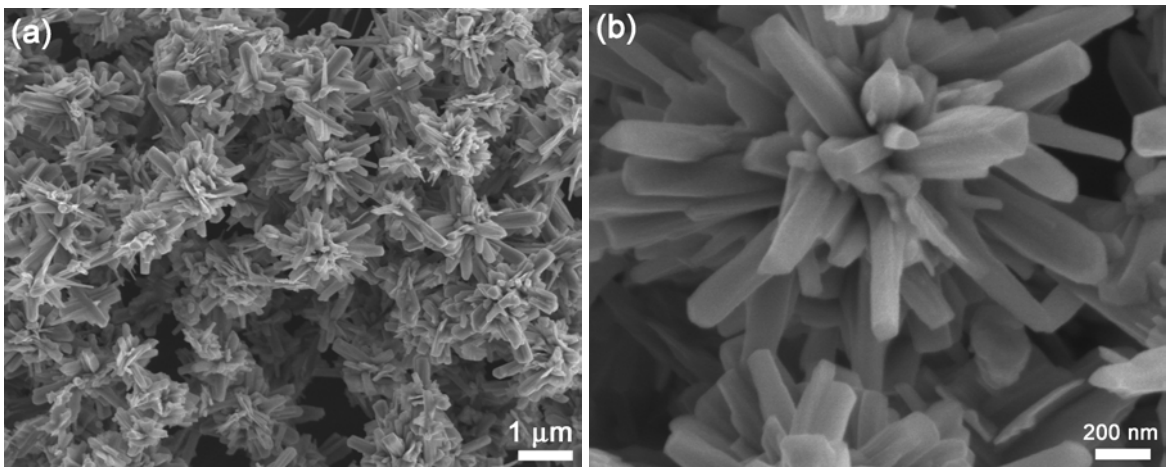


Fig. S4 (a) Low- and (b) high-magnification SEM images of bare NiS.

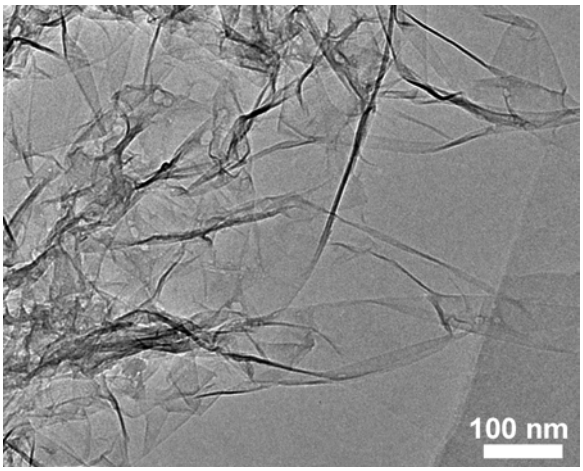
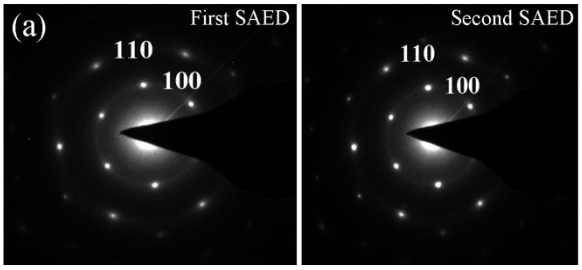


Fig. S5 TEM image of bare graphene.



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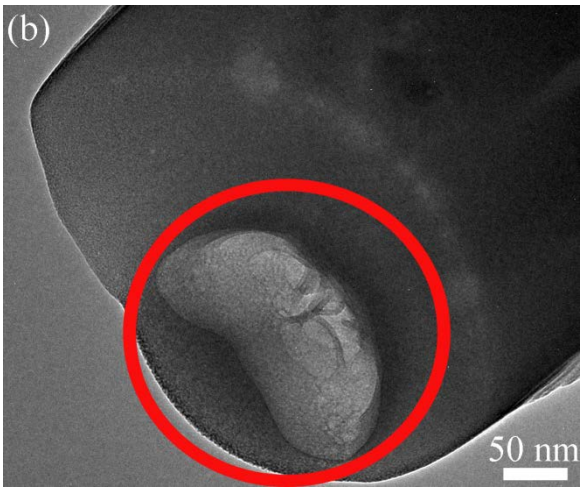

Fig. S6 (a) two SAED patterns of the circled area in Fig. S2b taken at a time interval of 1 min and (b) TEM of a NiS nanorod after electron beam irradiation.

In the above figure, SAED patterns were recorded at 200 kV acceleration voltage on the circled region in Fig. S2b for twice at a time interval of 1 min. Note that no obvious changes can be found in two patterns at a short time interval, indicating that the graphene is relatively stable upon electron beam irradiation for a short period of time (Fig. S6a). Acceleration voltage of 200–300 kV was often used to characterize graphene.[6-8] For NiS nanorod, damage immediately occurs upon electron beam irradiation as shown in the circled area in Fig. S6b.

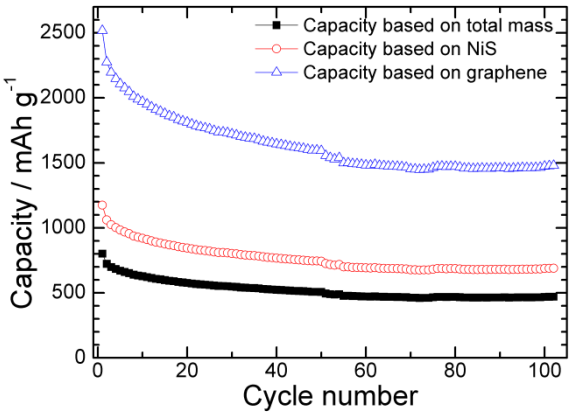

Fig. S7 Specific capacity of NiS/G based on total mass of hybrid, bare NiS and bare graphene.

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