Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

One-step Synthesis of Ni_3S_2 Nanoplatelets on Graphene for High Performance Supercapacitors

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From the CV curve, the specific capacitance is calculated from the following equation:

$$C = \frac{1}{v(V_2 - V_1)} \int_{V_1}^{V_2} I(V)\, dV,$$

where v is the scanning rate, $V_2 - V_1$ is the scanning range and $I(V)$ is the current density (A/g) corresponding to the voltage. From charge/discharge curve, the capacitance was calculated from:

$$C = \frac{dQ}{dU} = \frac{Idt}{dU} = \frac{I}{dU/dt},$$

where I is the current density for the charge/discharge test, dU/dt is the slope of the discharge curve.

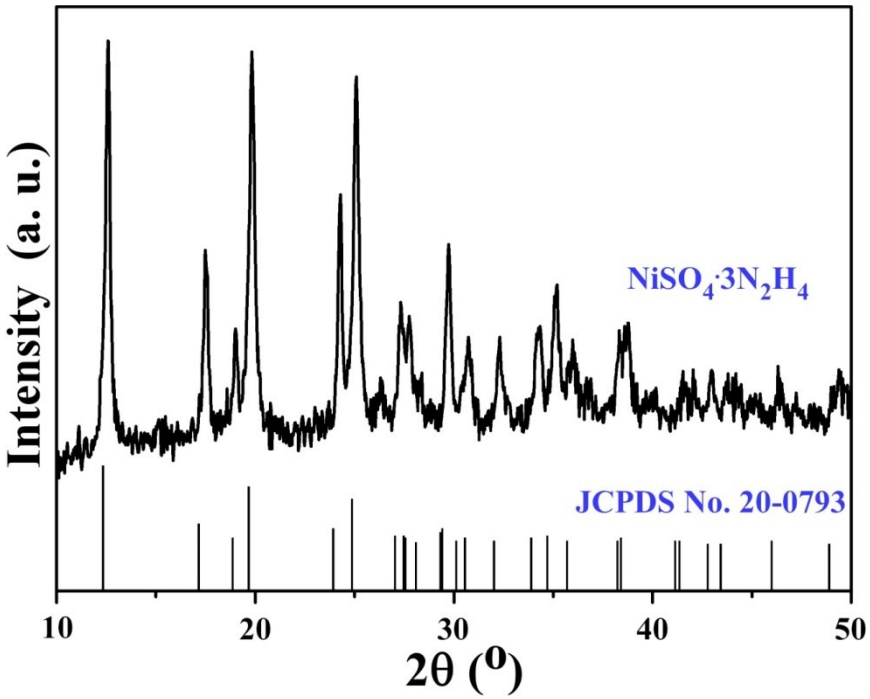

Fig. S1 XRD spectrum of $NiSO_4 \cdot 3N_2H_4$. Below is the standard JCPDS card of $NiSO_4 \cdot 3N_2H_4$.

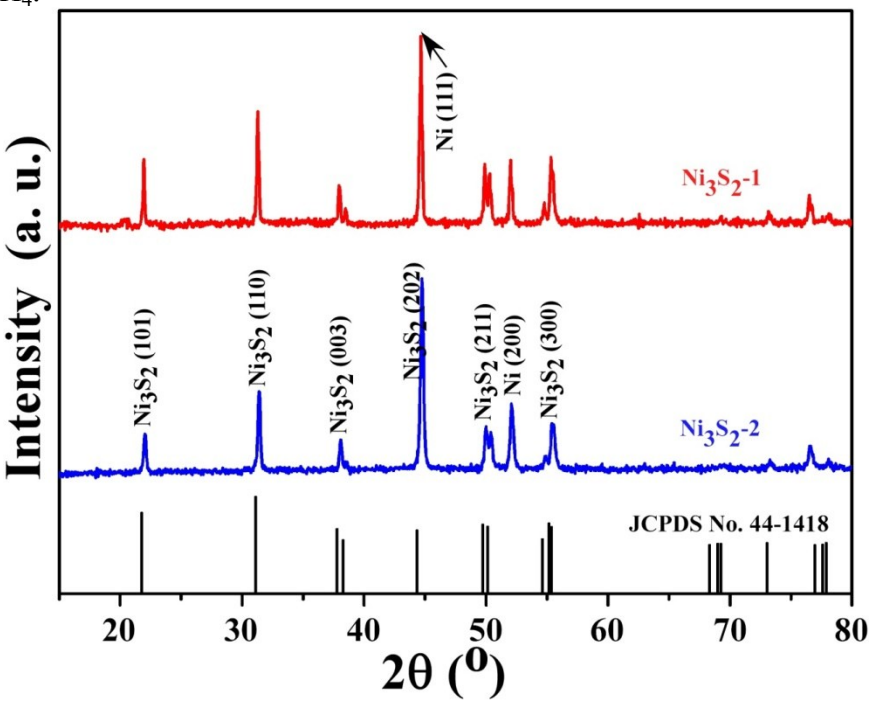

Fig. S2 XRD spectrum of Ni_3S_2 reduced from $NiSO_4 \cdot 7H_2O$ (Ni_3S_2-1) and $NiSO_4 \cdot 3N_2H_4$ (Ni_3S_2-2), respectively. Below is the standard JCPDS card of Ni_3S_2.

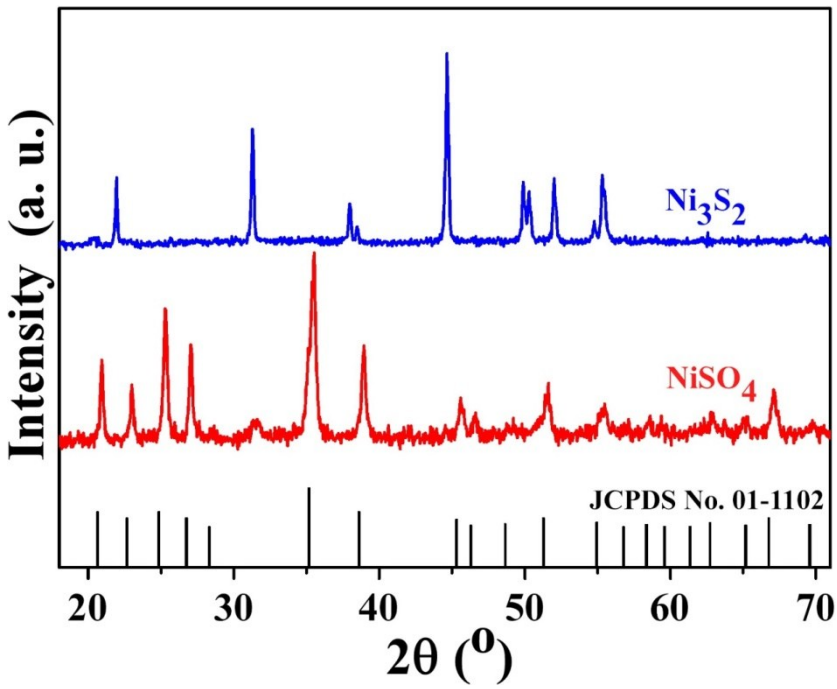

Fig. S3 XRD spectrum comparison of $NiSO_4 \cdot 7H_2O$ with/without H_2 reduction. Below is the standard JCPDS card of $NiSO_4$.

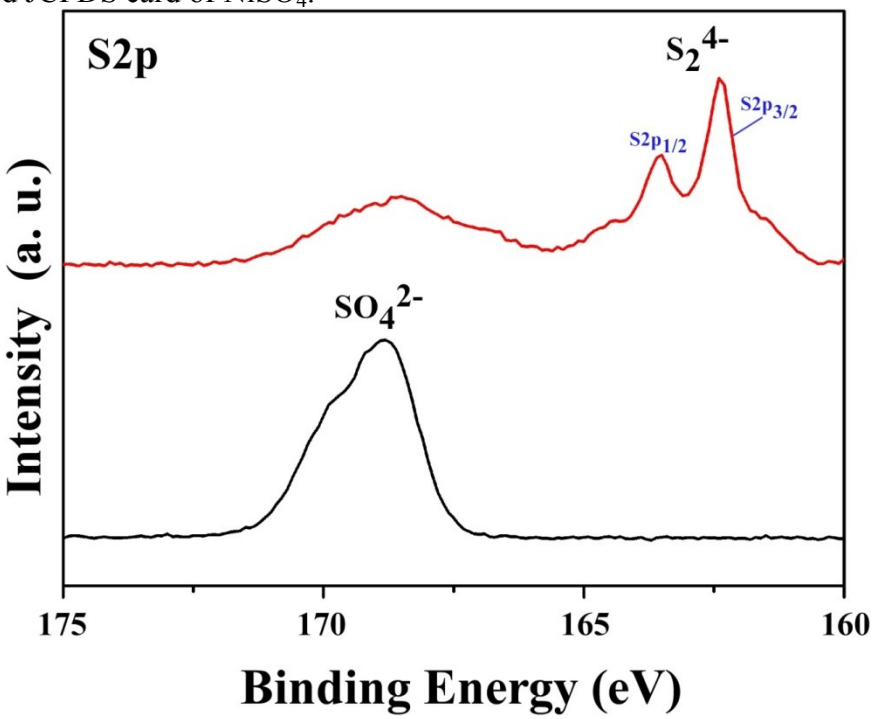

Fig. S4 High resolution S2p spectrum of $NiSO_4$ before and after H_2 reduction.

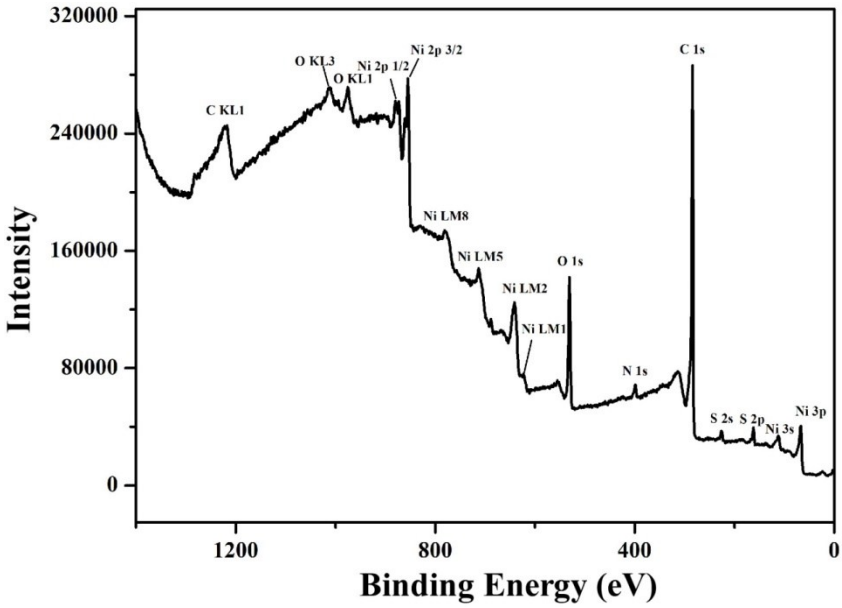

Fig. S5 XPS spectrum of Ni_3S_2/rGO-2.

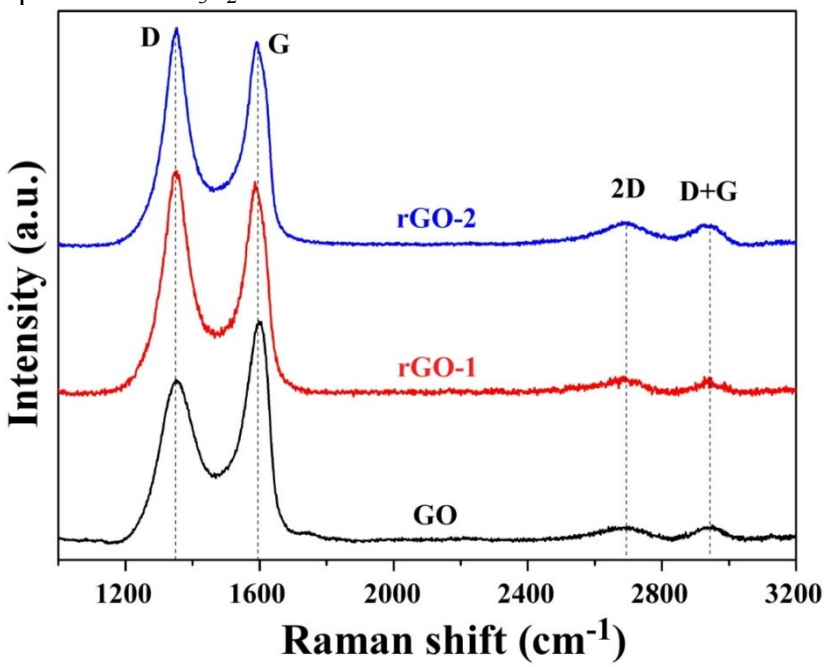

Fig. S6 Raman spectrums of GO in comparison with reduced graphene oxide (rGO) in Ni_3S_2/rGO-1 and Ni_3S_2/rGO-2.

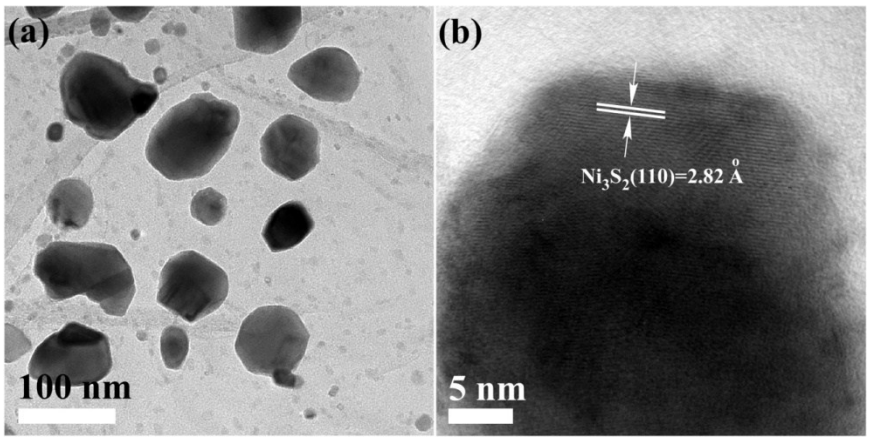

Fig. S7 TEM results of Ni_3S_2/rGO reduced from $NiSO_4$/GO. (1) Round and irregular shape Ni_3S_2 nanoparticles with non-uniform size on graphene surface. (2) High resolution TEM of the Ni_3S_2 nanoparticles.

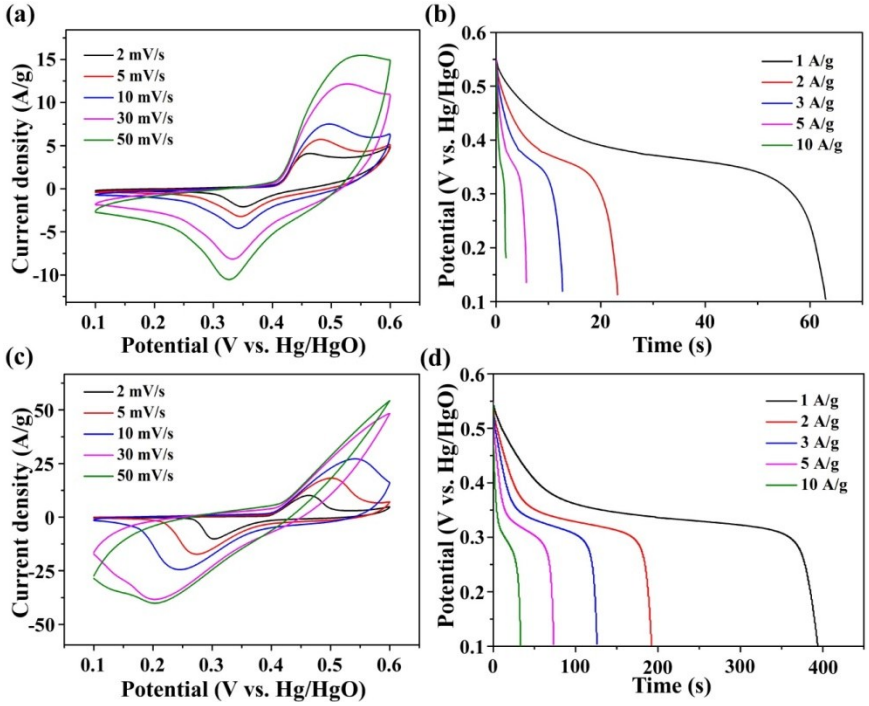

Fig. S8 Electrochemical test of electrodes made from Ni_3S_2/rGO-1 and Ni_3S_2/rGO-2. (a) Cyclic voltammetry (CV) curves for Ni_3S_2/rGO-1 at the scanning rate at the range of 2~50 mV s^{-1}. (b) Corresponding discharge results at current density from 1 A g^{-1} to 10 A g^{-1} for Ni_3S_2/rGO-1. (c) CV curve for Ni_3S_2/rGO-2. (d) Corresponding discharge result for Ni_3S_2/rGO-2.

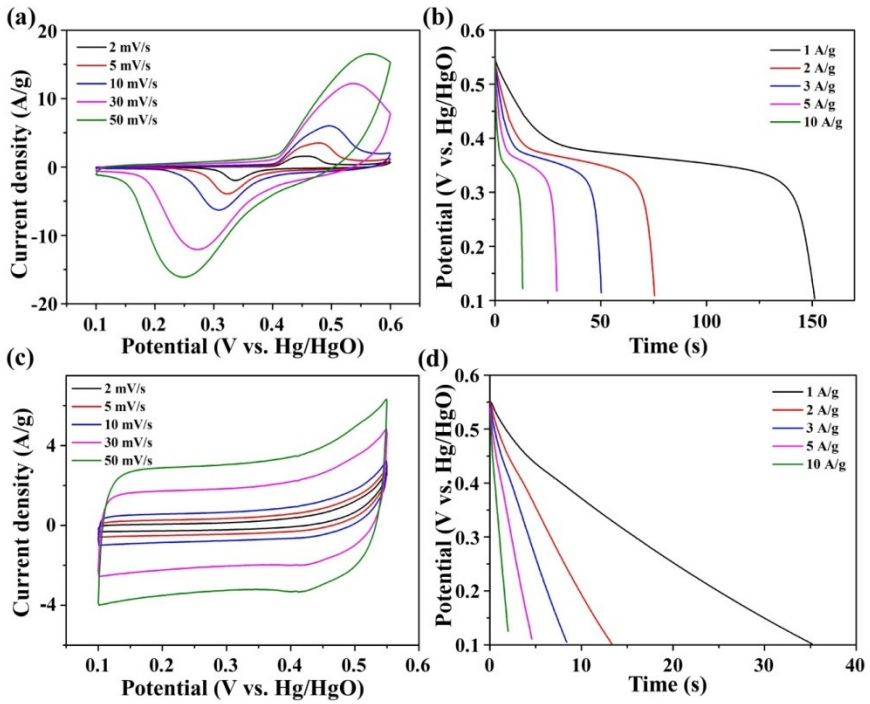

Fig. S9 Electrochemical test of electrodes made from pure Ni_3S_2-2 reduced from $NiSO_4 \cdot 3N_2H_4$ and pure reduced graphene oxide (rGO). (a) Cyclic voltammetry (CV) curves for Ni_3S_2-2 at the scanning rate at the range of 2~50 mV s^{-1}. (b) Corresponding discharge results at current density from 1 A g^{-1} to 10 A g^{-1} for Ni_3S_2/rGO-1. (c) CV curve for rGO. (d) Corresponding discharge result for rGO.

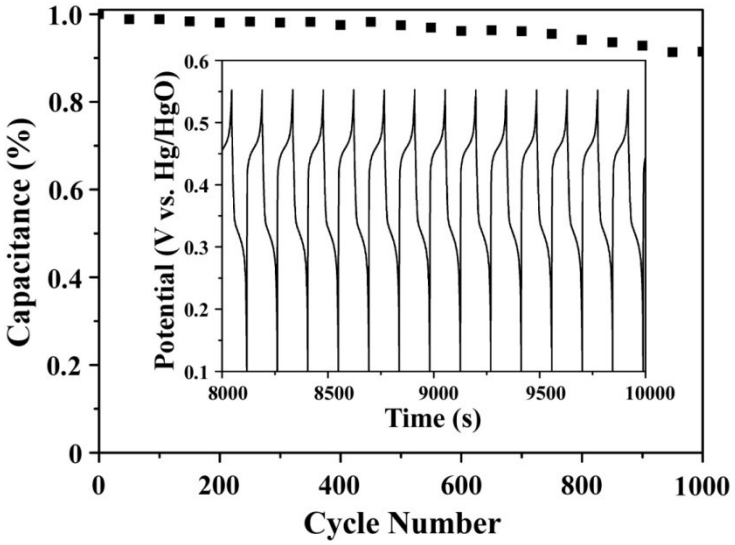

Fig. S10 Cycling stability of Ni_3S_2/rGO-2 at current density of 5 A g^{-1}. Inset is a part of the charge/discharge results.