Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Graphene-templated Growth of Hollow Ni_3S_2 Nanoparticles with Enhanced Pseudocapacitive Performance

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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.

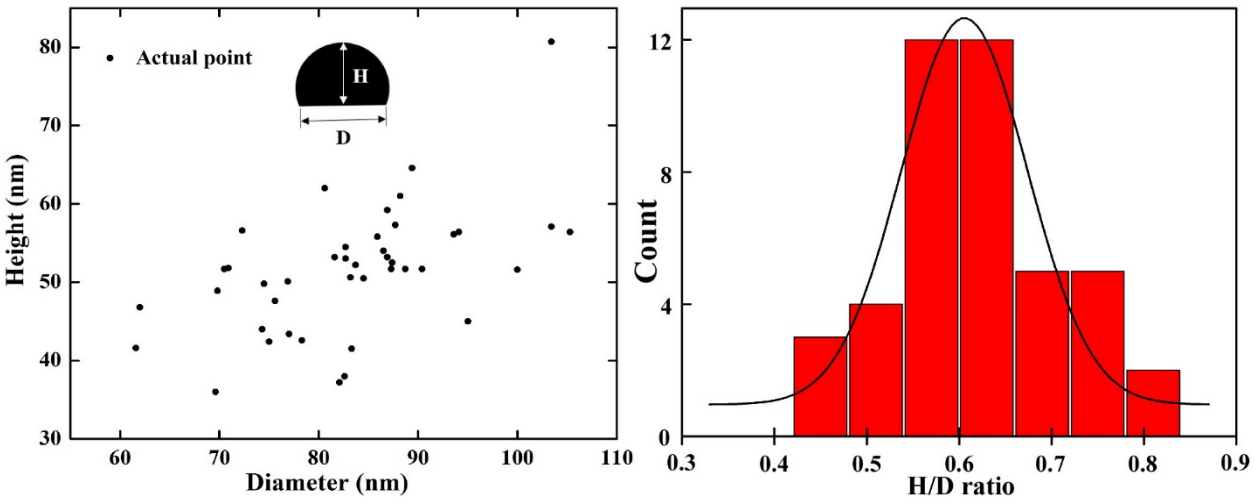

Figure S1. The Height (H) vs Diameter (D) diagram and H/D ratio histogram. (a) The black spherical points show the real droplet-shape data of Ni nanoparticles in sight. Inset picture shows the definition of D and H. (b) The average height/diameter ratio is 0.606 with the standard deviation of 0.068.

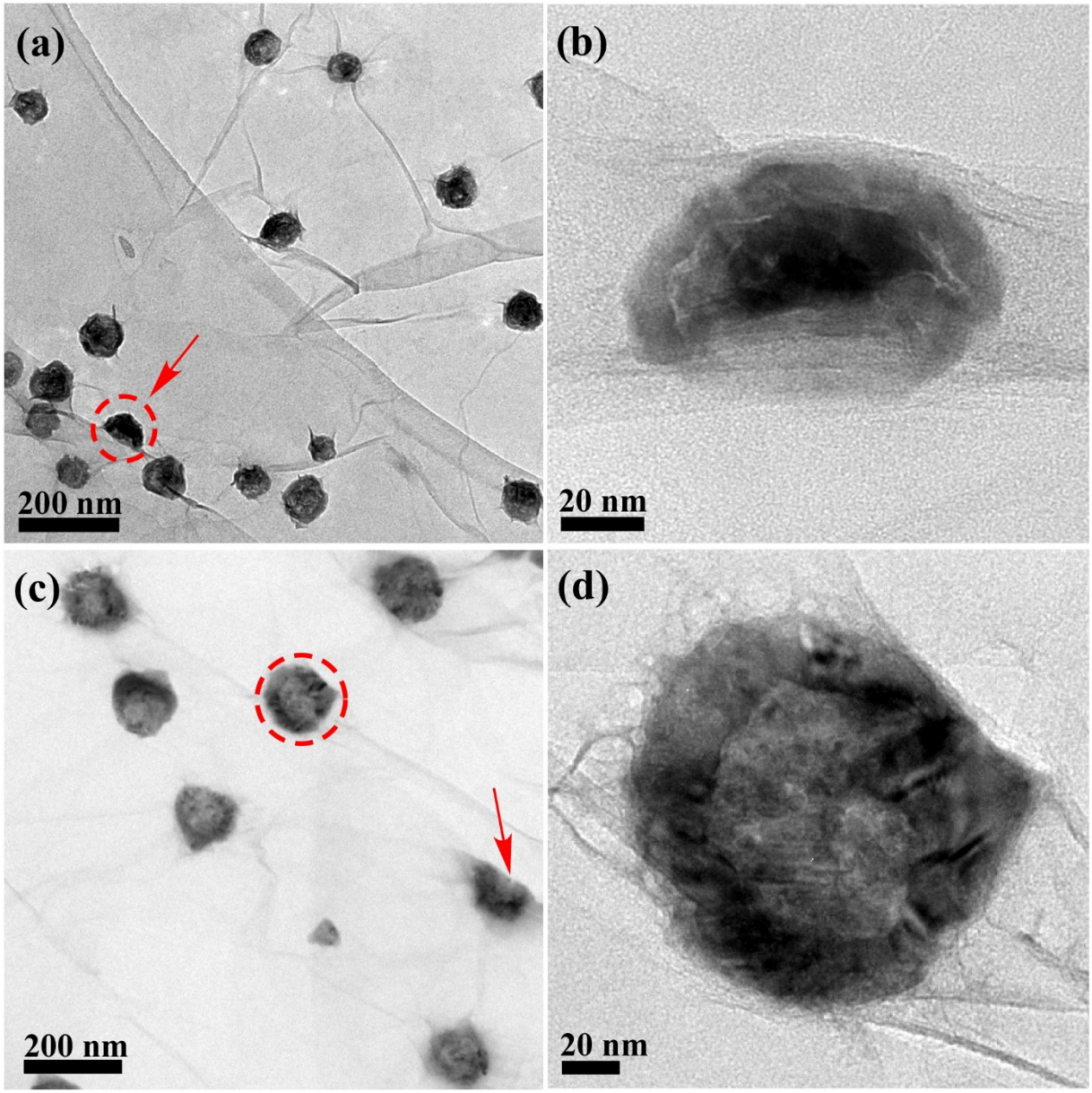

Figure S2. TEM images of core-shell Ni@Ni_3S_2 and hollow Ni_3S_2 grown on rGO. (a) The TEM image of Ni@Ni_3S_2/rGO. (b) Magnified image for the particle circled in Figure S2a. A core shell structure of Ni@Ni_3S_2 can be found. (c) TEM image of hollow Ni_3S_2/rGO. Pointed out with red arrow shows the droplet-shape nanoparticle. (d) Magnified image for circled particle in Figure S2c shows the hollow structure.

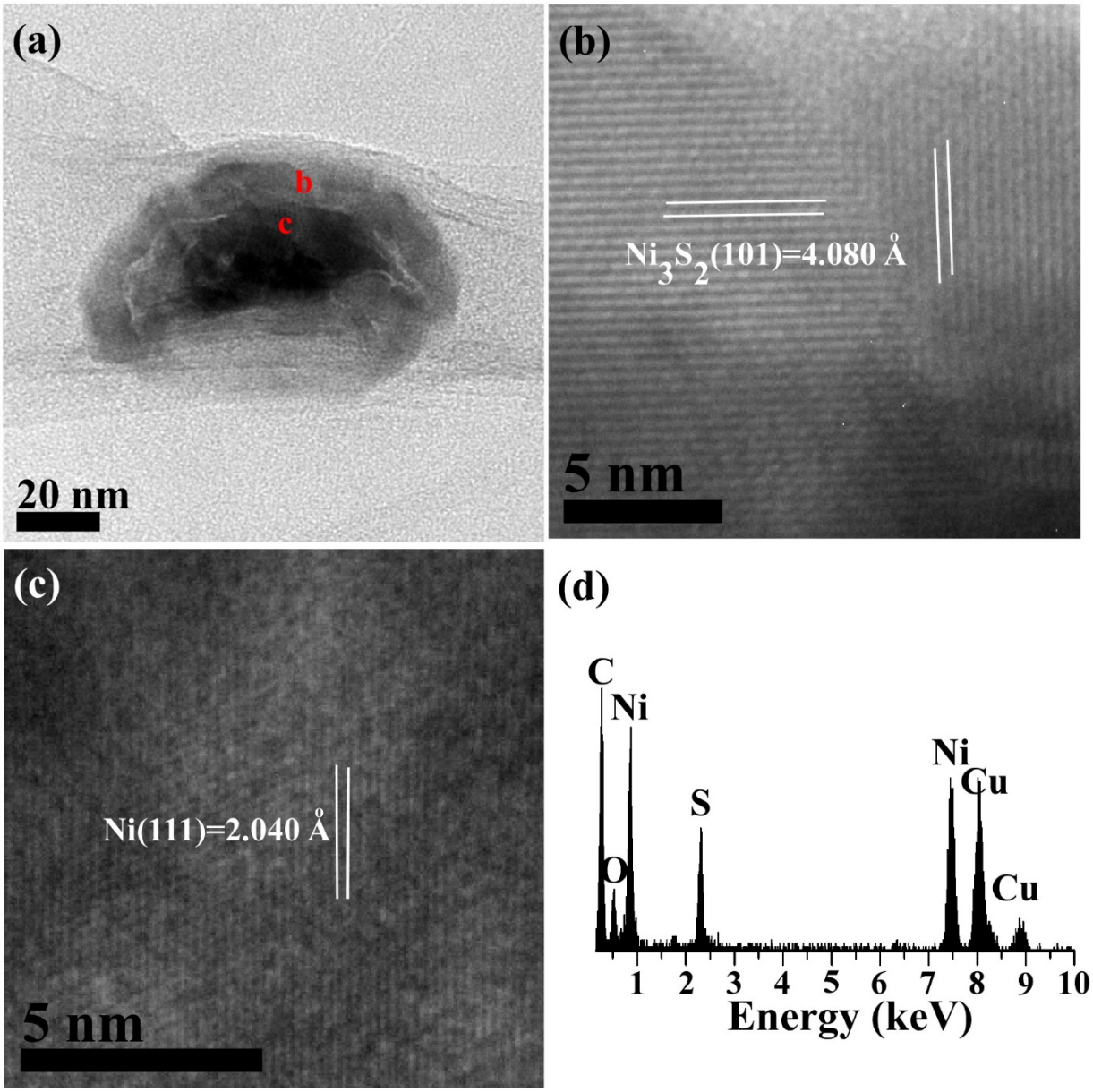

Figure S3. TEM images and EDS spectrum of Ni@Ni_3S_2/rGO. (a)TEM image of core-shell Ni@Ni_3S_2. The high resolution TEM for part b and part c are shown in (b) and (c). The plane spacing of 4.080 Å is corresponding to Ni_3S_2(101), and the plane spacing of 2.040 Å is attributed to Ni(111). (d) EDS spectrum. The Ni/S molar ratio is about 3.

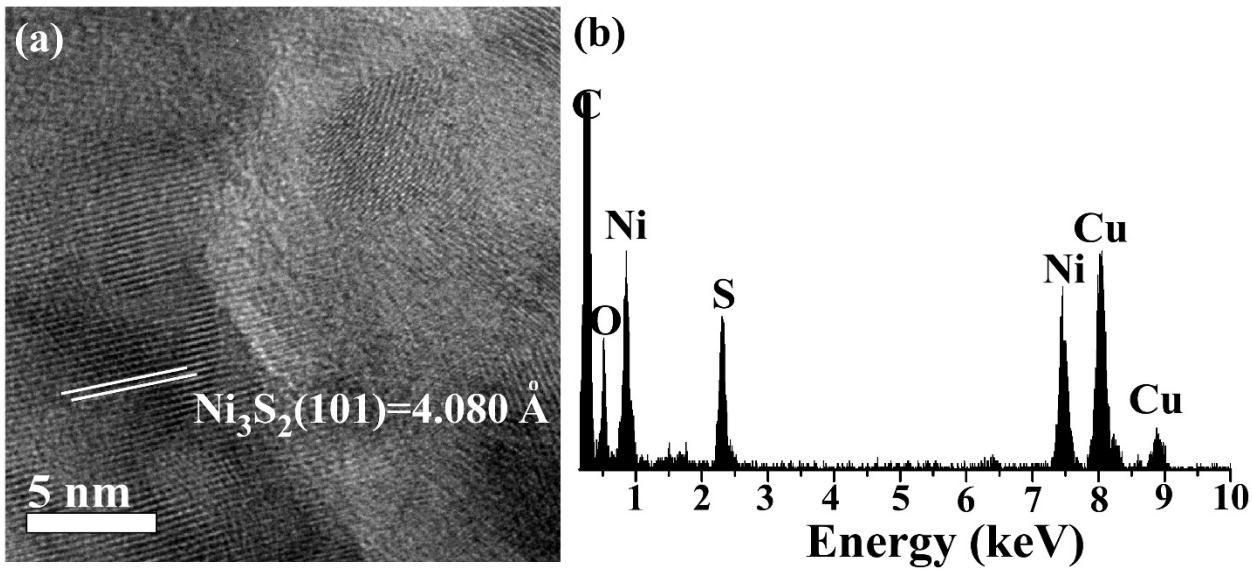

Figure S4. TEM images and EDS spectrum of hollow Ni_3S_2/rGO. (a)The high resolution TEM. The plane spacing of 4.080 Å is corresponding to Ni_3S_2(101), and the inset is FFT. (b)The EDS spectrum. The Ni/S ratio is about 1.5.

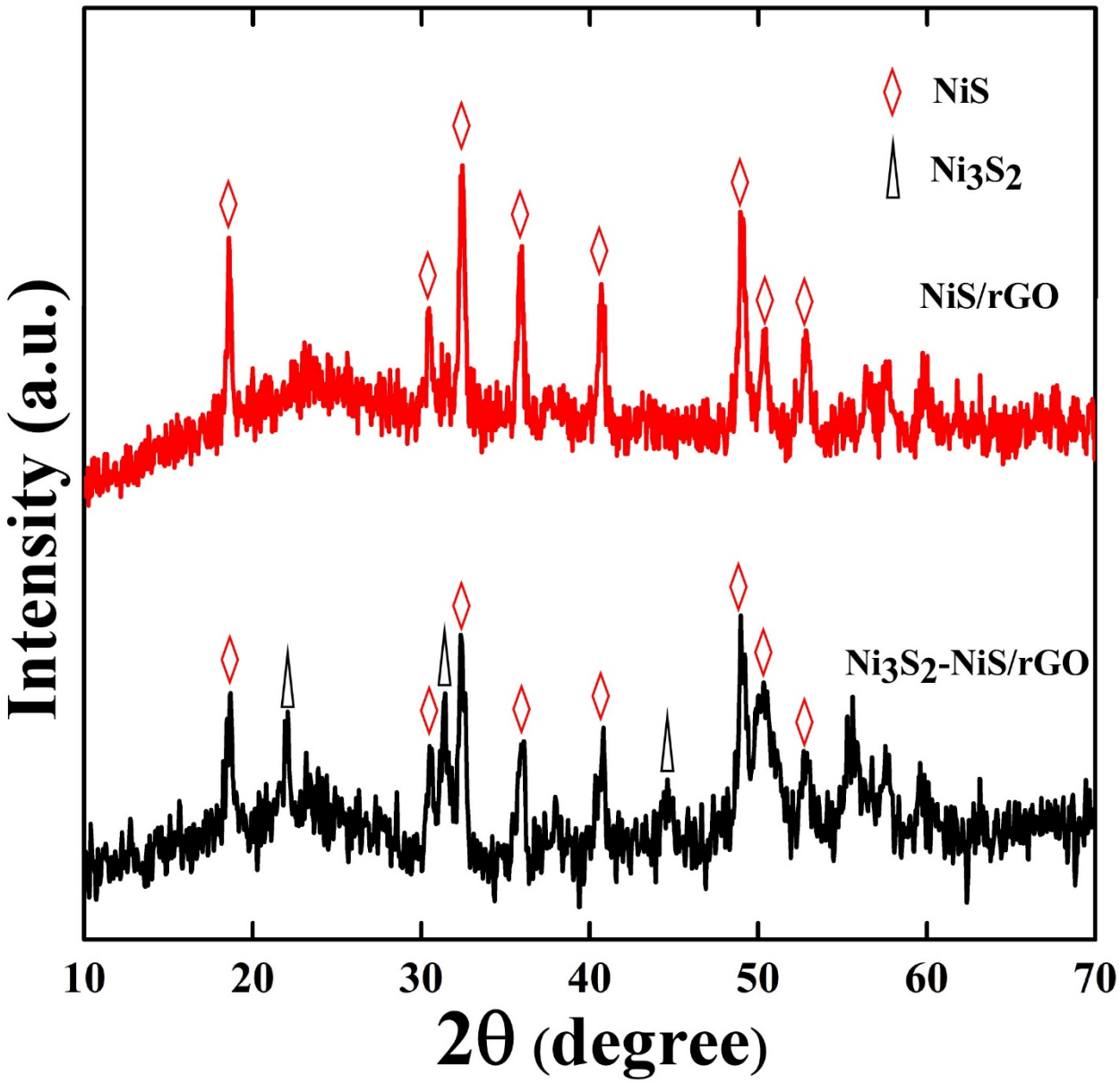

Figure S5. XRD results for NiS-Ni_3S_2/rGO and NiS/rGO respectively. The peaks for NiS, Ni_3S_2 and C are pointed out respectively.

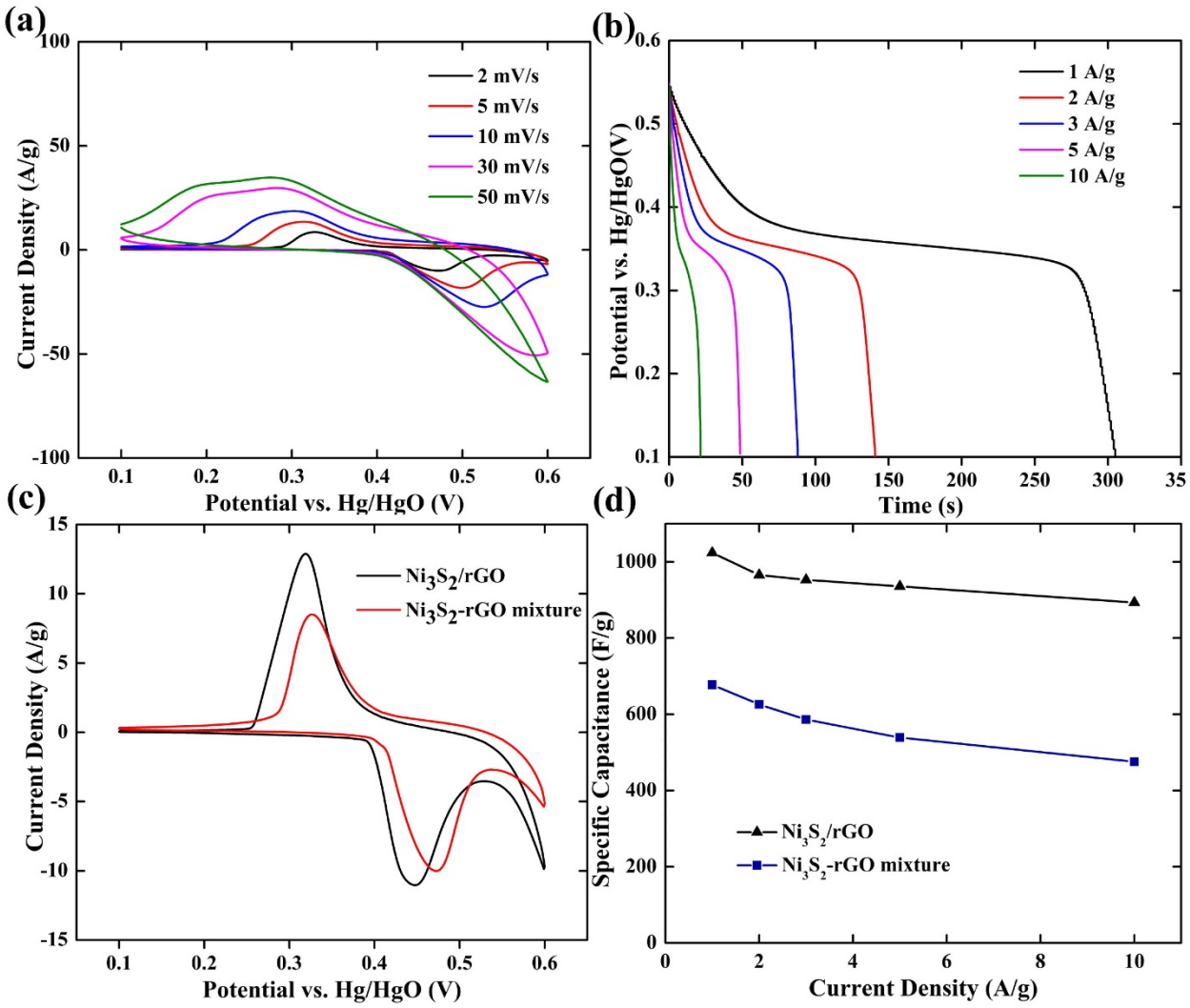

Figure S6. Electrochemical test of electrodes made from Ni_3S_2-rGO physical mixture. (a) The CV curves at the scanning rate of 2 mV/s, 5 mV/s, 10 mV/s, 30 mV/s and 50 mV/s. (b) Discharge results at different current density of 1 A/g, 2 A/g, 3 A/g, 5 A/g and 10 A/g. (c) The comparison of CV curve for Ni_3S_2/rGO composite and Ni_3S_2-rGO physical mixture at scanning rate of 2 mV/s. (d) Rate capacity comparison of Ni_3S_2/rGO composite and Ni_3S_2-rGO physical mixture.

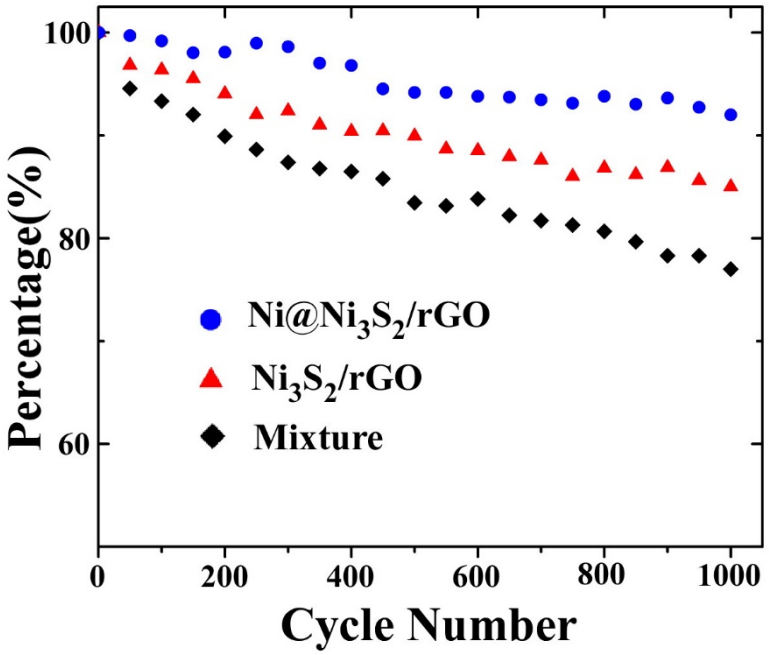

Figure S7. Cycle stability of core-shell Ni@Ni_3S_2/rGO, hollow Ni_3S_2/rGO and Ni_3S_2-rGO physical mixture.