Electronic supplementary information

Facile construction of Ni_3S_2 arrays through hydrothermal route-assisted sulfurization of nickel foam as self-supported electrodes for supercapacitors

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Experimental

All the chemicals were of analytical grade and were used without further purification. Nickel foam (5 cm × 4 cm) was carefully cleaned with 2 M HCl solution in an ultrasound bath for 30 min to remove the possible surface oxide layer, and then cleaned with deionized water and absolute ethanol for 15 min each. In a typical synthesis, 2 mmol of thioacetamide (TAA) were dissolved in 40 mL of deionized water to form a homogeneous solution. Afterward, the solution and the pretreated Ni foam were transferred into a 50 mL Teflon-lined stainless-steel autoclave, which was sealed and maintained at 120 °C for 4 h. After the autoclave cooled down to room temperature, the Ni foam was taken out of solution and washed with absolute ethanol followed by deionized water three times. The sample was then dried in vacuum at 60 °C for 3 h for characterization.

The morphology and microstructure of the synthesized sample were characterized by a scanning electron microscopy (SEM, Hitachi S4800) equipped with an energy-dispersive X-ray spectrometer (EDX). X-ray diffraction (XRD) patterns were collected on a Rigaku Dmax-2500 X-Ray Diffractometer with Cu Ka radiation (λ = 0.15406 nm). Transmission electron microscopy (TEM) images, high-resolution TEM (HRTEM) images were recorded on a JEOL 2010 electron microscope with an accelerating voltage of 200 kV.

Electrochemical measurements were performed in a conventional three-electrode electrochemical

cell.The sulfurized Ni foam (1 cm x 1 cm) was directly used as a working electrode. A platinum electrode and a saturated calomel electrode (SCE) were used as counter and reference electrodes, respectively. All potentials were referred to the reference electrode and all electrochemical measurements were performed at room temperature in 2 M aqueous KOH solution. The electrochemical performance of the samples was evaluated on a CHI 660D (Cheng Hua, Shang Hai) workstation for cyclic voltammetry (CV) and chronopotentiometry (CP) tests.

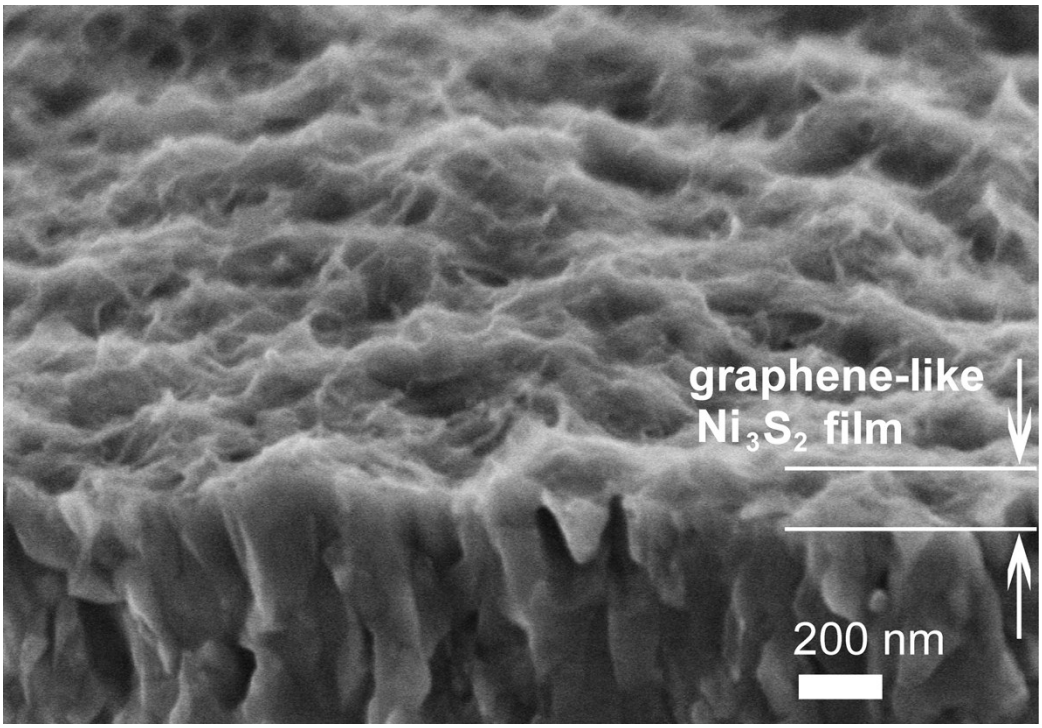

Figure S1. the section image of the as-prepared NSNF. From the figure, the thickness of the graphene-like film is about 100 ~200 nm.

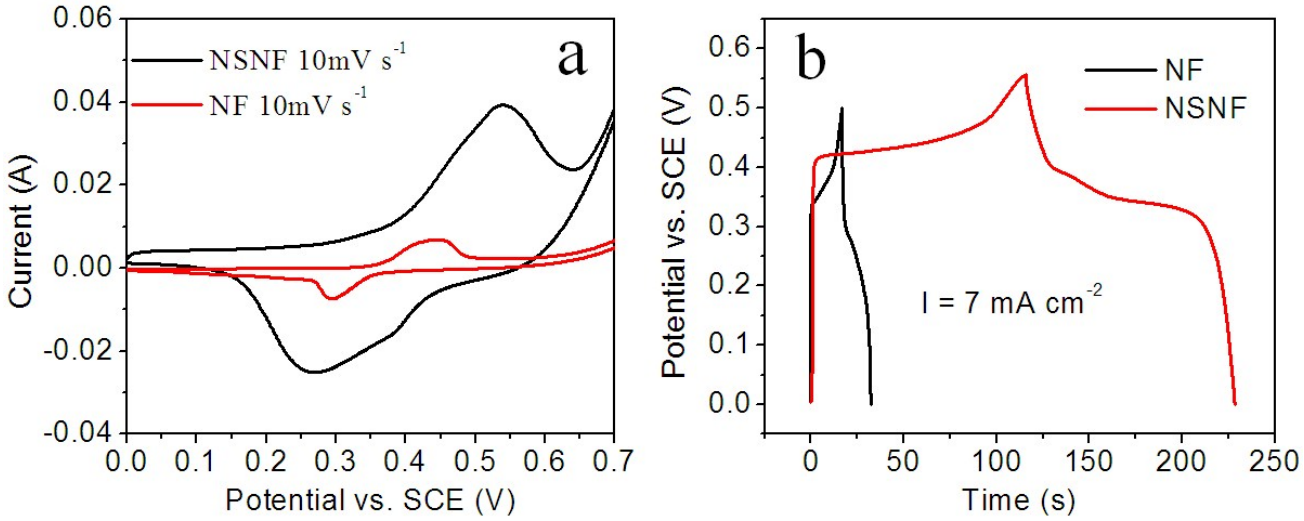

Figure S2. Electrochemical comparison of NF and NSNF: (a) CVs at 10 mV s^{-1}; (b) Charge/discharge curves at 7 mA cm^{-2}.

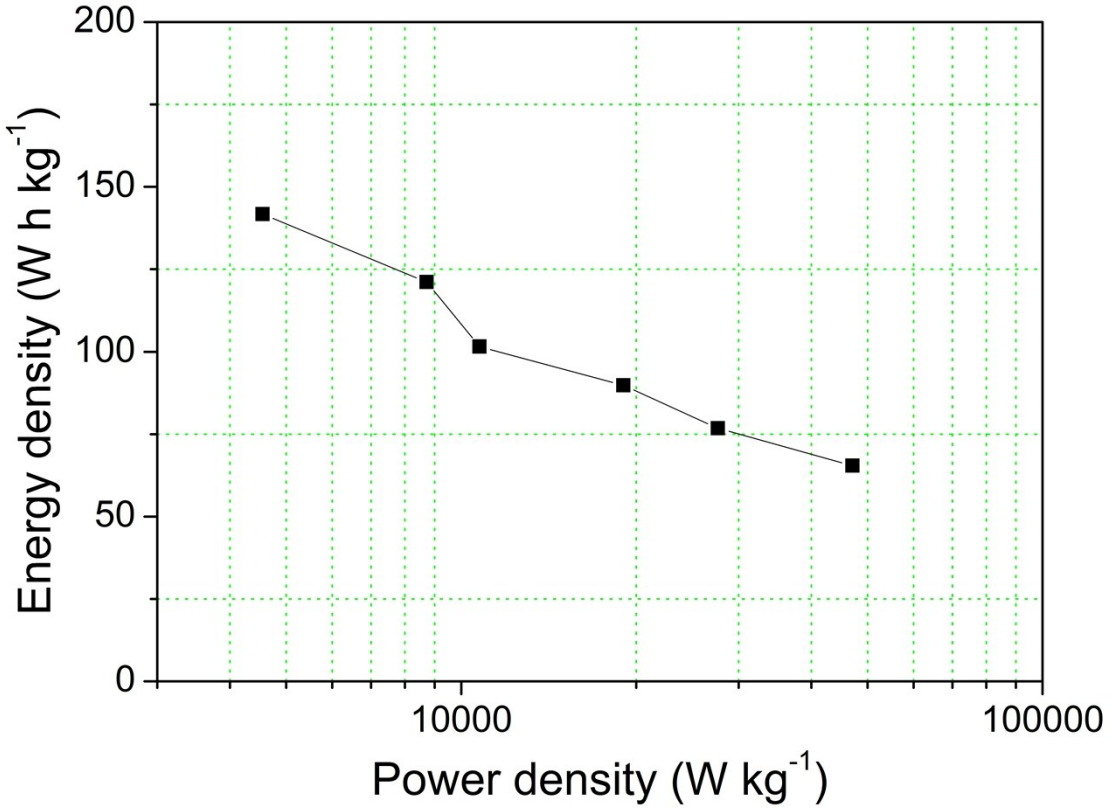

Figure S3. Ragone plot (power density vs. energy density) of the NSNF at various charge/discharge rates. The power density and energy density are calculated from the following eqtions, respectively.

$E = 1/2\ C * \triangle V^2$ $P = E/t$ Where E (W h kg^{-1}), C (F g^{-1}), ΔV (V), P (W kg^{-1}), and t (h) are the energy density, specific capacitance, potential window of discharge, power density, and discharge time, respectively. When the power density is 47.11, 27.64, 19.01, 10.75, 8.72 and 4.55 kW kg^{-1} , the NSNF electrode delivers an energy density values 65.43, 76.80, 89.79, 101.53, 121.12 and 141.69 Wh kg^{-1} at current densities of 7, 15, 25, 35, 50 and 70 mA cm^{-2},repectively.