Supporting Information

Hierarchical Foam of Exposed Ultrathin Nickel Nanosheets Supported on Chainlike Ni-Nanowires and the Derivative Chalcogenide for Enhanced Pseudocapacitance

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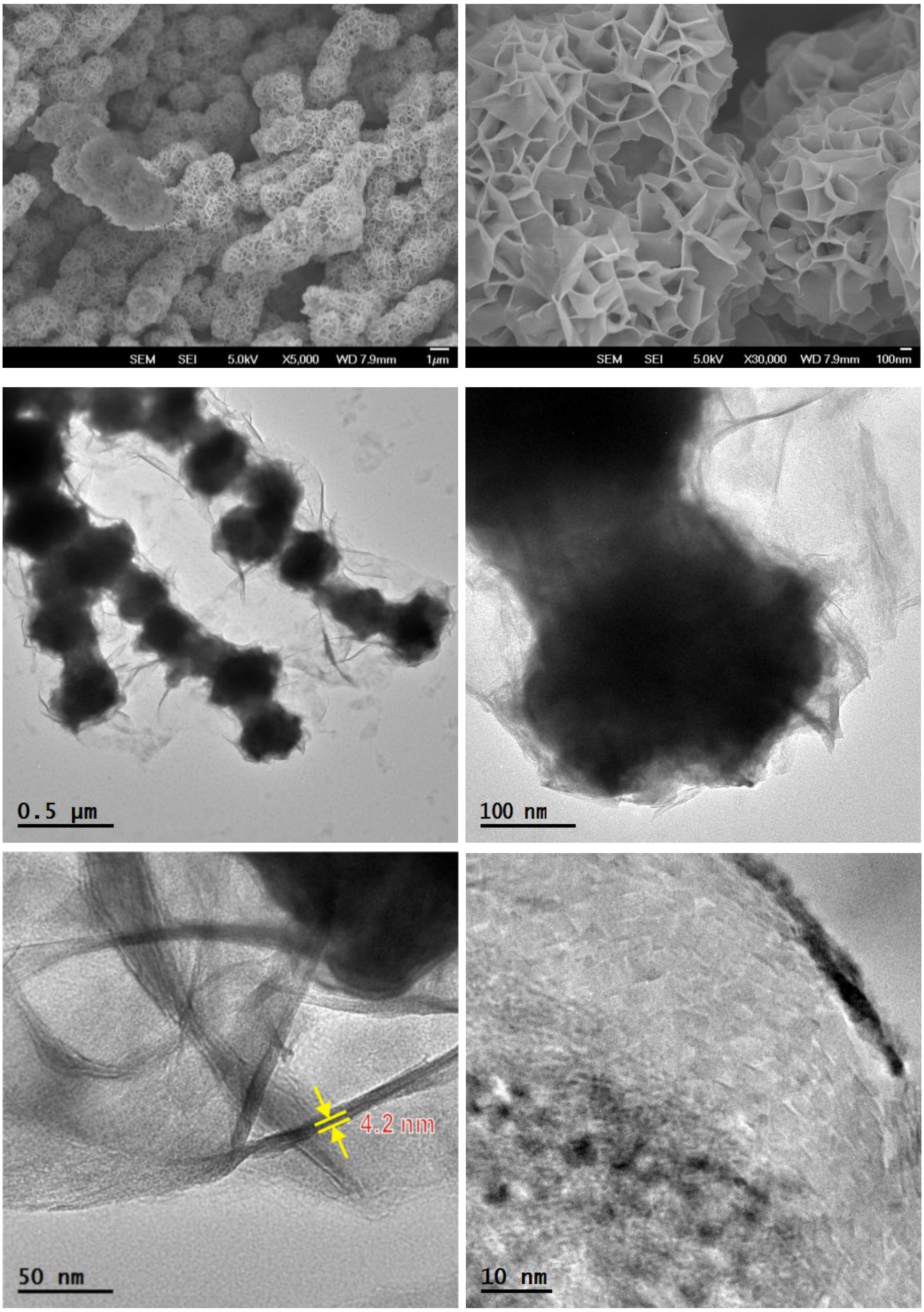

Figure S1. The complementary TEM photos of Ni nanofoam with altered nucleation and growth rate. And some Ni lamellae (with visibly exposed sharp edge directly facing the viewer) are even thinner than 5 nm.

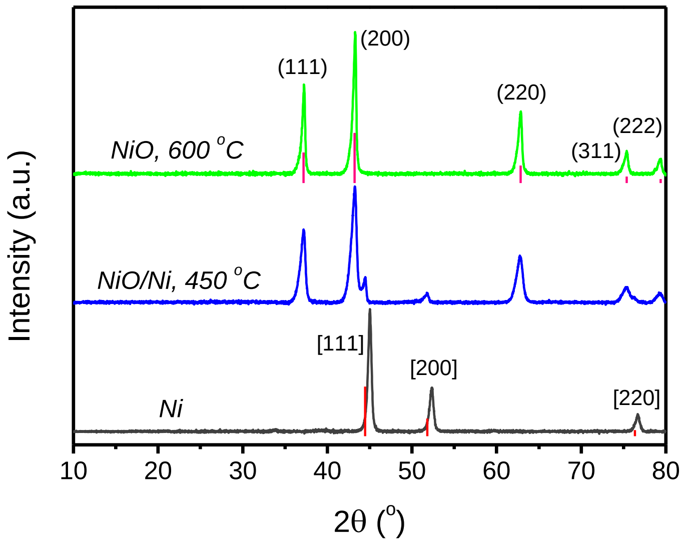

Figure S2. The evolution of XRD spectra of the Ni nanofoam under air annealing.

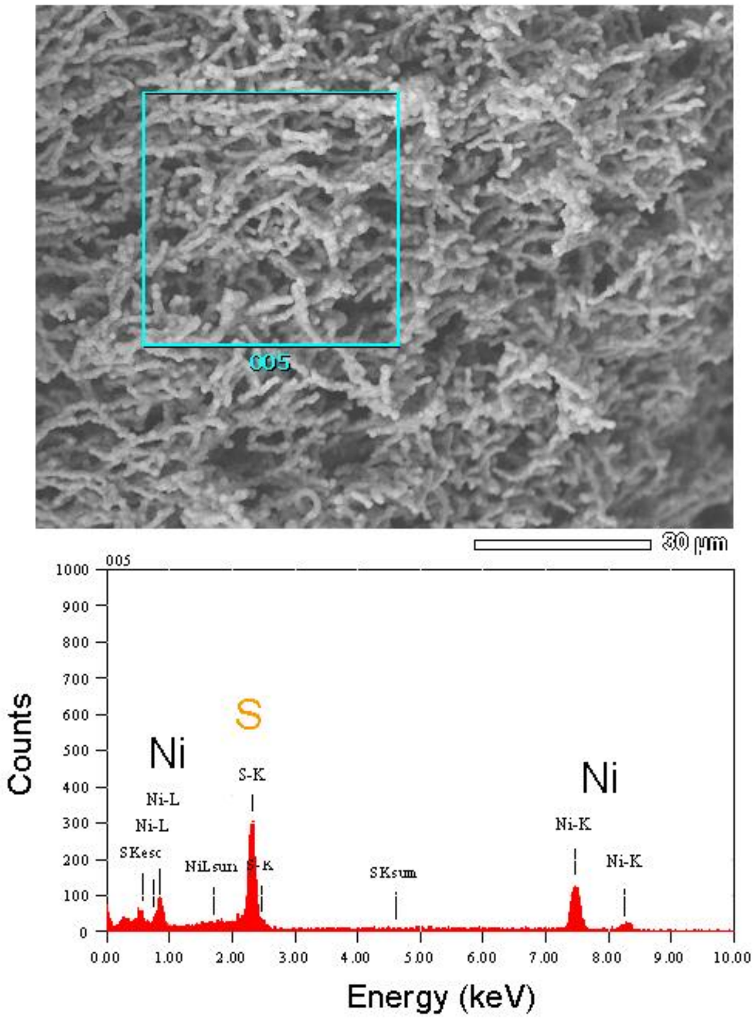

Figure S3 Energy dispersive X-ray spectrum (EDS) of the nanostructured NiS_2.

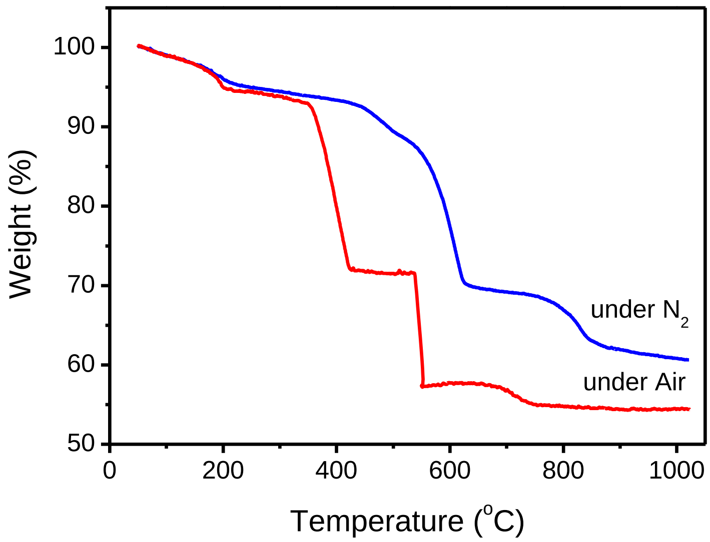

Figure S4. TGA curves of the as-prepared NiS_2 (300 °C sulfidation sample) in N_2 and air atmospheres, respectively. Desulfurization process by thermal decomposition occurs under a nitrogen atmosphere, and an oxidative desulfurization process under air calcination.

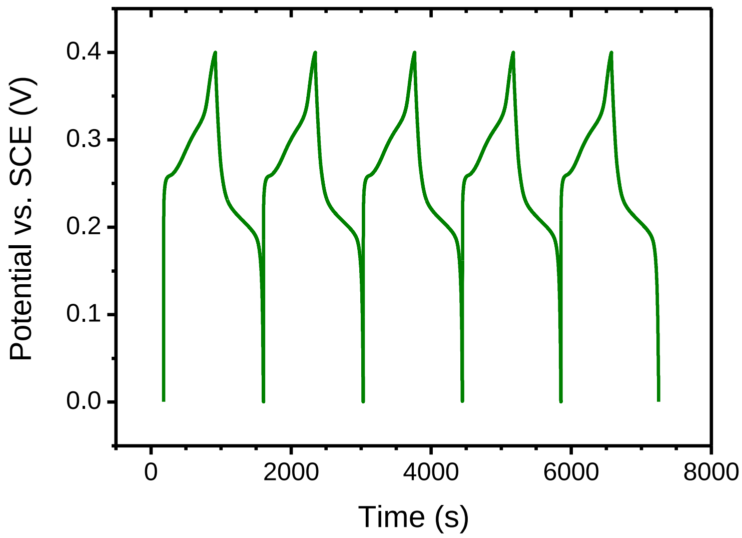

Figure S5. The charge/discharge curves of NiS_2 at a current density of 1 A g^{-1}.

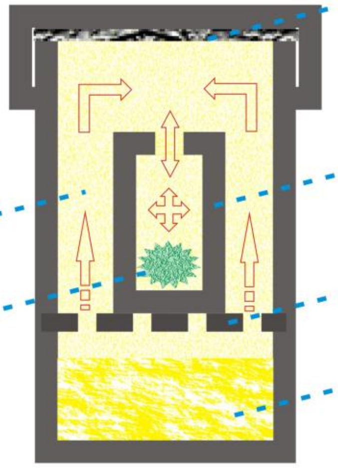

Figure S6. A sketch of the tailor-made steel autoclave for high-pressure sulfidation of e.g. the as-synthesized Ni-nanofoam. An enough amount of sublimed sulfur powder (i.e. 2-3 g) is deposited in the bottom of a 25-mL steel autoclave, the Ni-nanofoam with volume of 1-2 cm^3 contained in a narrow-mouth glass bottle is located on a porous steel scaffold in the autoclave, then a soft folded Al-foil is pressed and tightly sealed as a gasket. After transferred into a program-controlled muffle furnace, the high-pressure sulfur vapor forms [Ref 1,2] and the sulfidation of metals happens. One of the advantages is that it offers smaller sulfur molecules [Ref 3] and higher rate of diffusion and thus a more effective reaction process, yet with no sulfur residue on the product surface.

[1] B. Meyer. ‘Elemental Sulfur,’ *Chem. Rev.*, **1976**, *76*, 367-388.
[2] W. A. West, A. W. C. Menzies. ‘The Vapor Pressures of Sulphur between 100° and 550° with related Thermal Data,’ *J. Phys. Chem.*, **1928**, *33*, 1880-1892.
[3] S. Xin, L. Gu, N.-H. Zhao, Y.-X. Yin, L.-J. Zhou, Y.-G. Guo, L.-J. Wan. ‘Smaller Sulfur Molecules Promise Better Lithium–Sulfur Batteries,’ *J. Am. Chem. Soc.*, **2012**, *134*, 18510-18513.

S1. Crystallographic Structures

Ni: face-centered cubic (fcc) structure (Nickel, syn, JCPDS card no. 04-0850, *Fm-3m (225)*, a_o=b_o=c_o=3.524 Å).

NiO: cubic structure (Bunsenite, syn, JCPDS card no. 47-1049, *Fm-3m (225)*, a_o=b_o=c_o=4.177 Å).

NiS_2: cubic structure (Vaesite, JCPDS card no. 11-0099, *Pa-3 (205)*, a_o=b_o=c_o=5.670 Å)

Data based on *ICDD/JCPDS PDF Retrievals [Level-1 PDF, Sets 1-51 (04/25/07)]*

S2. Reference on 'Vaesite (NiS_2)'

Kerr, P. F. (1945) Cattierite and vaesite: new Co–Ni minerals from the Belgian Congo. *Amer. Mineral.*, *30*, 483-497. (http://www.minsocam.org/ammin/AM30/AM30_483.pdf)

Vaesite NiS_2, © 2001-2005 Mineral Data Publishing, version 1 (http://rruff.info/doclib/hom/vaesite.pdf)

Vaesite Mineral Data (http://webmineral.com/data/Vaesite.shtml)

Vaesite mineral information and data (http://www.mindat.org/min-4133.html)

Last accessed on 03/12/1013

S3. Extended Reading Interests

Metal Aerogels (http://www.aerogel.org/?p=932)

Metal Oxide Aerogels (http://www.aerogel.org/?p=44)

Semiconducting Metal Chalcogenide Aerogels (http://www.aerogel.org/?p=560)

Last accessed on 05/12/1013