Supplementary Information for

Growth-Controlled NiCo$_2$S$_4$ Nanosheet Arrays with Self-Decorated Nanoneedles for High-Performance Pseudocapacitors

Liyang Lin$^{a,b}$¶, Jianlin Liu$^{a,c}$¶, Tianmo Liu$^{b,*}$, Jinghua Hao$^{a,b}$, Kemeng Ji$^a$, Rong Sun$^a$, Wen Zeng$^b$, Zhongchang Wang$^a$

$^a$Advanced Institute for Materials Research, Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai 980-8577, Japan
$^b$College of Materials Science and Engineering, Chongqing University, Chongqing 400030, China
$^c$Department of Applied Physics, Chongqing University, Chongqing 400044, China
Fig. S1 XRD pattern for the sample SS$_0$ powders scraped from Ni foam.
Fig. S2 TEM images and EDS spectra for an individual nanoneedles detached from the nanosheets in the NiCo$_2$S$_4$ sample SS$_0$. 
Fig. S3  N₂ adsorption-desorption isotherm and pore size distribution curves of the NiCo₂S₄ sample SS₀ powders scraped from the substrate.
**Figure S4**

**Fig. S4** SEM images of the NiCo$_2$S$_4$ sample synthesized by replacing NH$_4$F with NH$_4$Cl during the reaction.
Fig. S5 Phase degrees as a function of frequency for the electrode SS₀.
Fig. S6 (a) Schematic illustration of the sample SS₀ symmetric supercapacitor. (b) CV curves of the SS₀ device at various scan rates from 20 to 100 mVs⁻¹ measured between 0 and 1.0 V. (c) GCD curves at various current densities. (d) The specific capacitance as a function of current density. (e) Ragone plot showing energy and power densities of the symmetric supercapacitor. (f) Cycling stability of symmetric supercapacitor at a current density of 20 Ag⁻¹. The insets show the first and the last five GCD curves.