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Electronic Supplementary Information

Bacterial cellulose-based sheet-like carbon aerogels for in-situ growth of nickel sulfide as high performance electrode materials for asymmetric supercapacitors

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Table S1 Electrical conductivity of bulk c-BC and CA

Sample	Electrical conductivity (S cm^{-1})
c-BC	0.01-0.25
CA	0.5-1.0

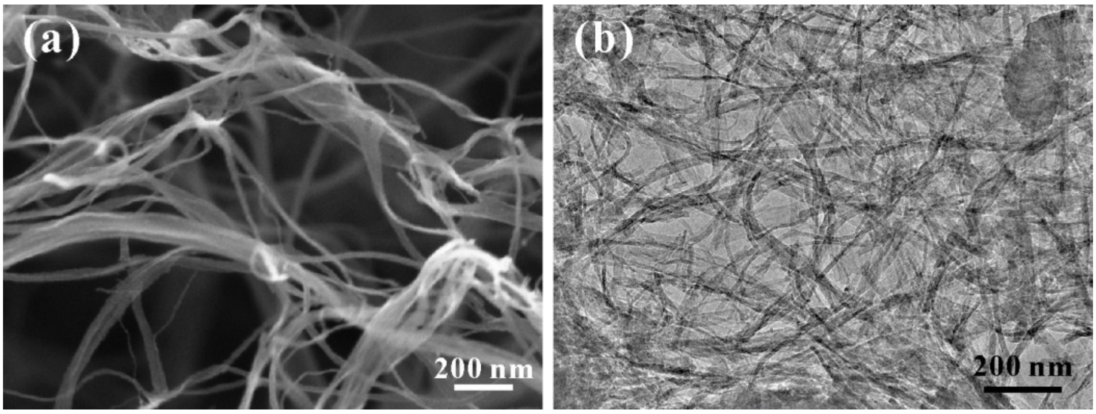

Fig. S1 (a) SEM and (b) TEM images of carbonized BC pellicle (c-BC).

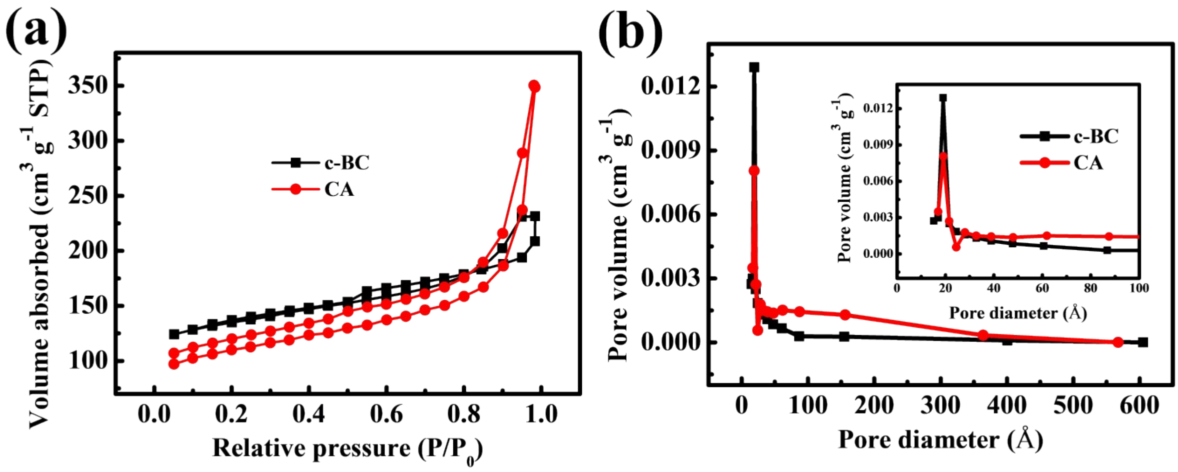

Fig. S2 (a) Nitrogen adsorption-desorption isotherms and (b) pore size distribution of c-BC and CA.

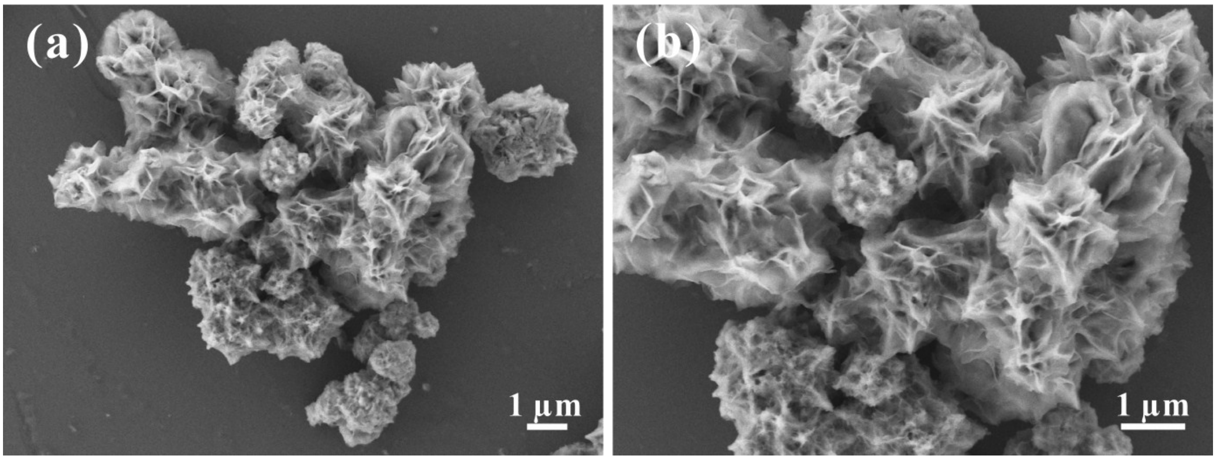

Fig. S3 SEM images of NiS particles.

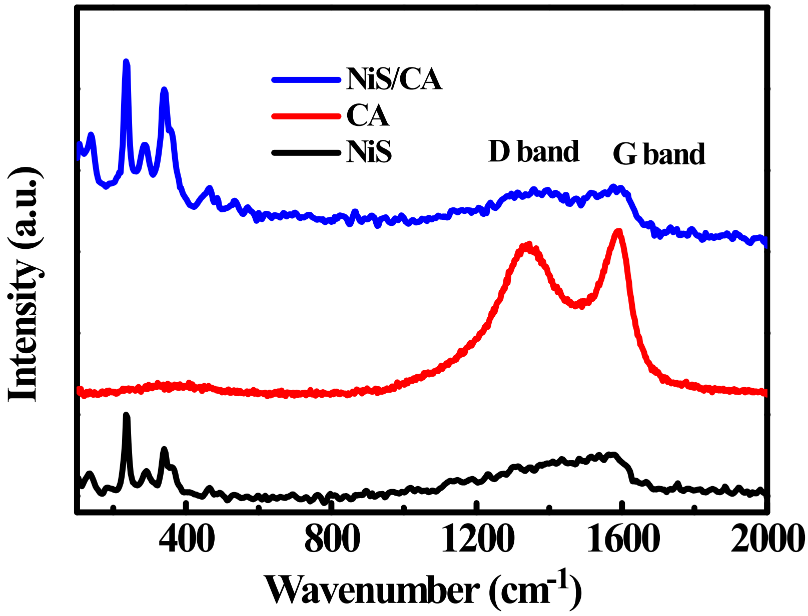

Fig. S4 Raman spectra of pure NiS, CA, and NiS/CA-2 composite.

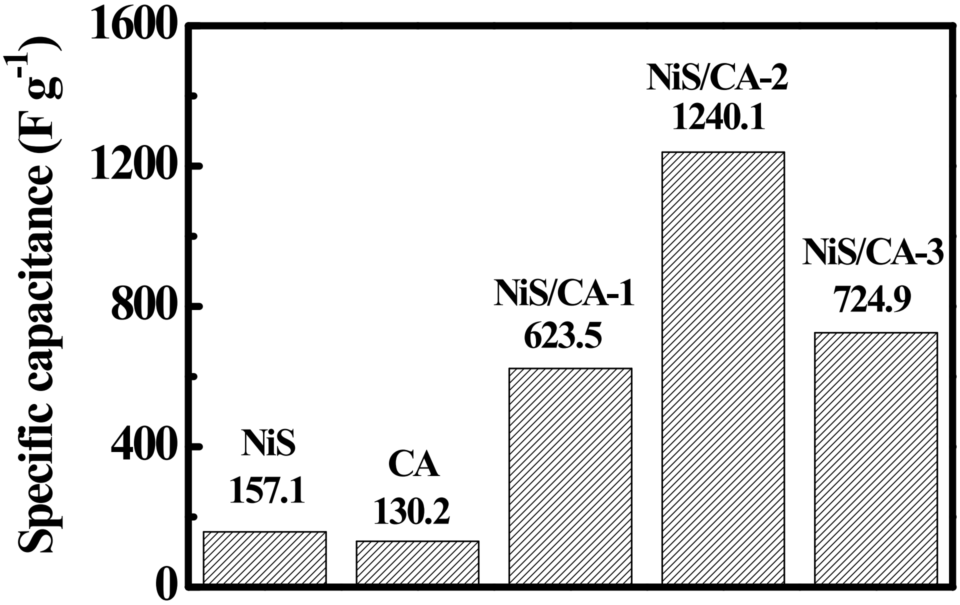

Fig. S5 Specific capacitance of NiS, CA, NiS/CA-1, NiS/CA-2, and NiS/CA-3 electrodes calculated based on CV curves (Fig. 4a) at a scan rate of 10 mV s^{-1}.

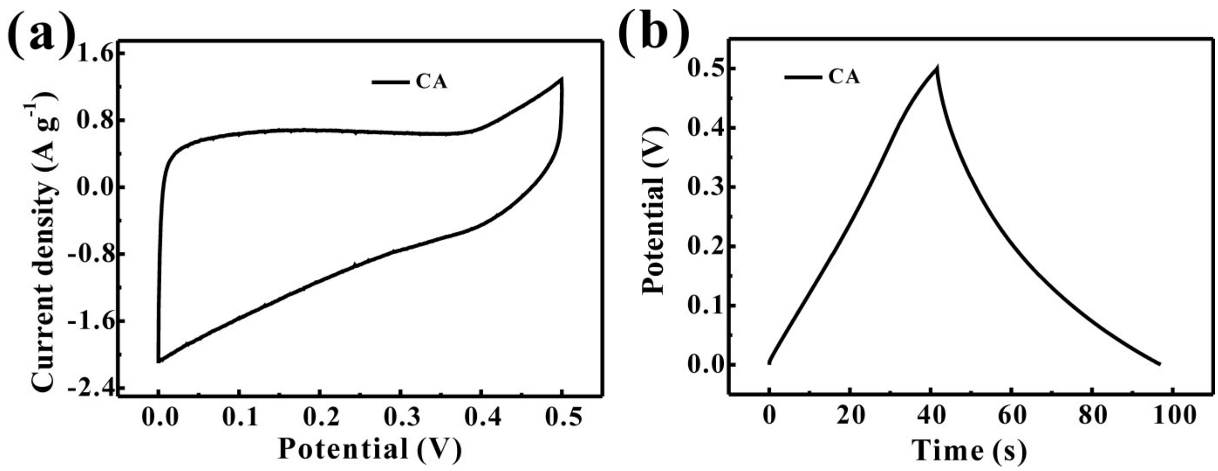

Fig. S6 (a) CV curve of CA at a scan rate of 10 mV s^{-1} and (b) galvanostatic charge-discharge curve of CA at the current density of 1 A g^{-1}.

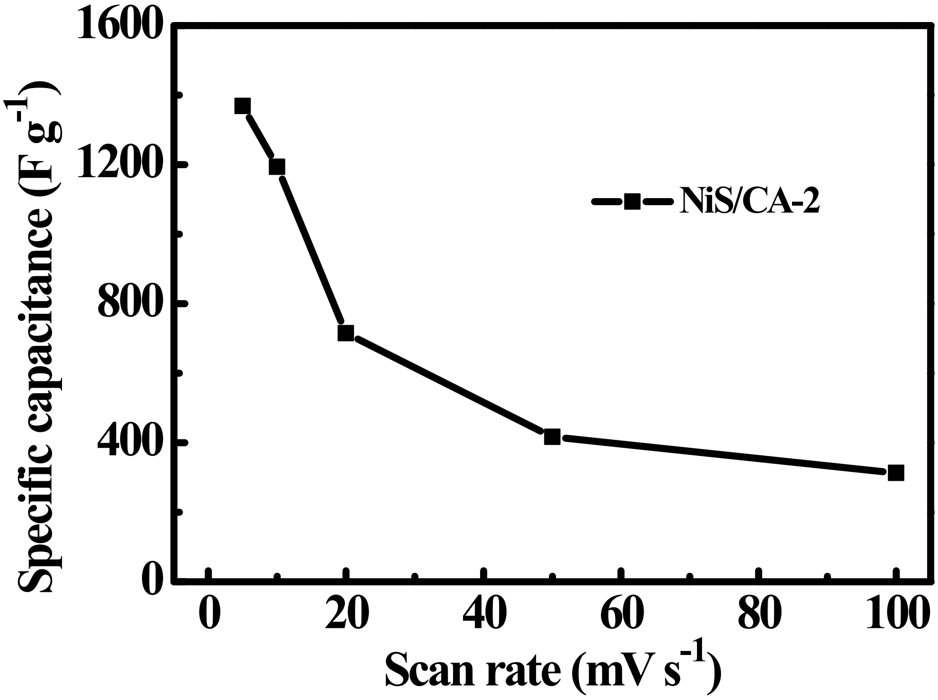

Fig. S7 Specific capacitance of NiS/CA-2 at different scan rates.

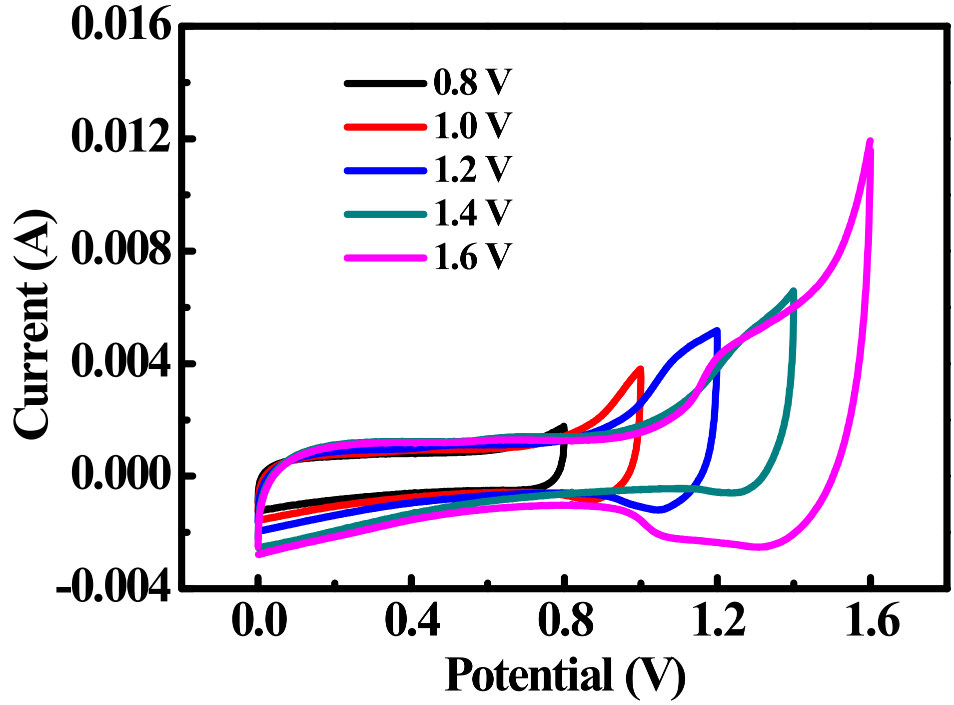

Fig. S8 CV curves of the NiS-CA-2//CA device with voltage varying from 0.8 to 1.6 V at a sweep rate of 20 mV s^{-1}.

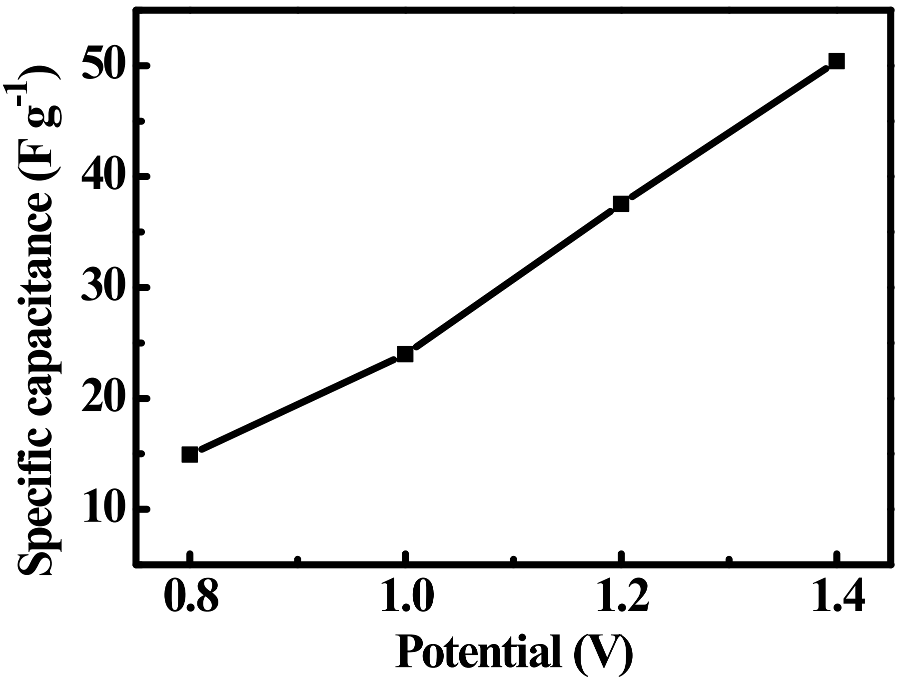

Fig. S9 Specific capacitance of the NiS-CA-2//CA device under different operation voltage range at a scan rate of 20 mV s^{-1}.

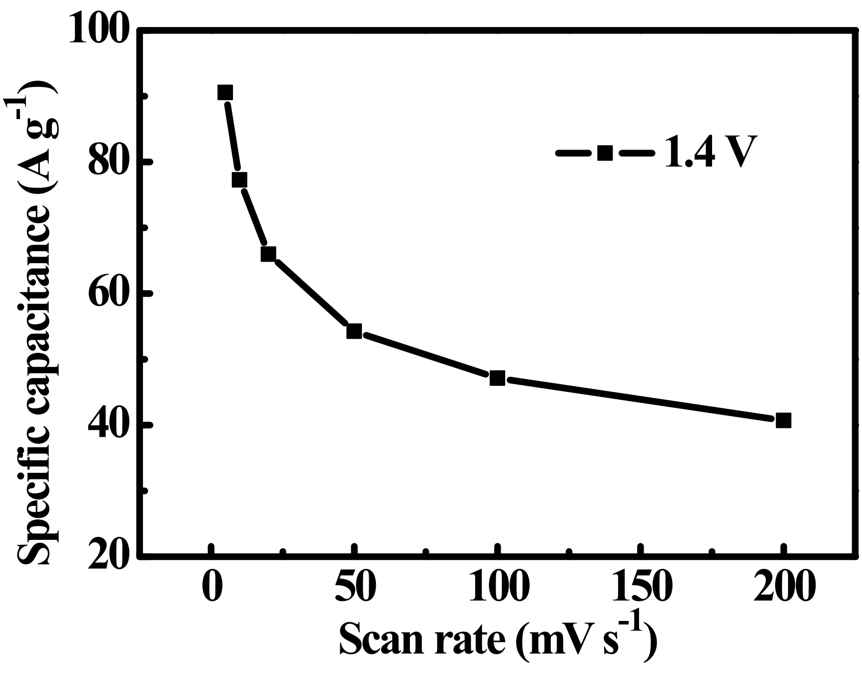

Fig. S10 Specific capacitance of the NiS-CA-2//CA device at different scan rates (calculated based on the CV curves in Fig. 7a).

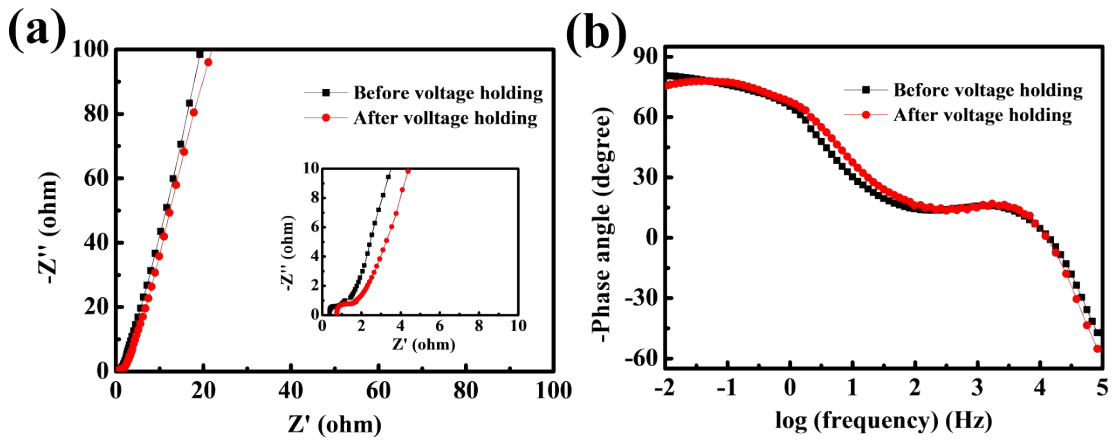

Fig. S11 (a) Nyquist plots (inset shows high frequency region) and (b) bode plots obtained from EIS measurements of NiS-CA-2//CA device before and after the floating test.

The Nyquist plots were also compared after voltage-holding (floating) test and the results are presented in Fig. S11(a). As can be seen, a little increase in initial equivalent series resistance from 0.39 to 0.78 Ω after voltage holding test is observed in the Nyquist plots. Moreover, the obtained EIS data were further analysed using Bode plots, which represent the change in the phase angle with respect to applied frequency. As shown in Fig. S11, the phase angle are about -81° and -78° at 0.01 Hz before and after voltage holding, respectively, which are both close to that of ideal capacitor (-90°), indicating that the assembled NiS/CA-2//CA device possesses good capacitive behaviour.

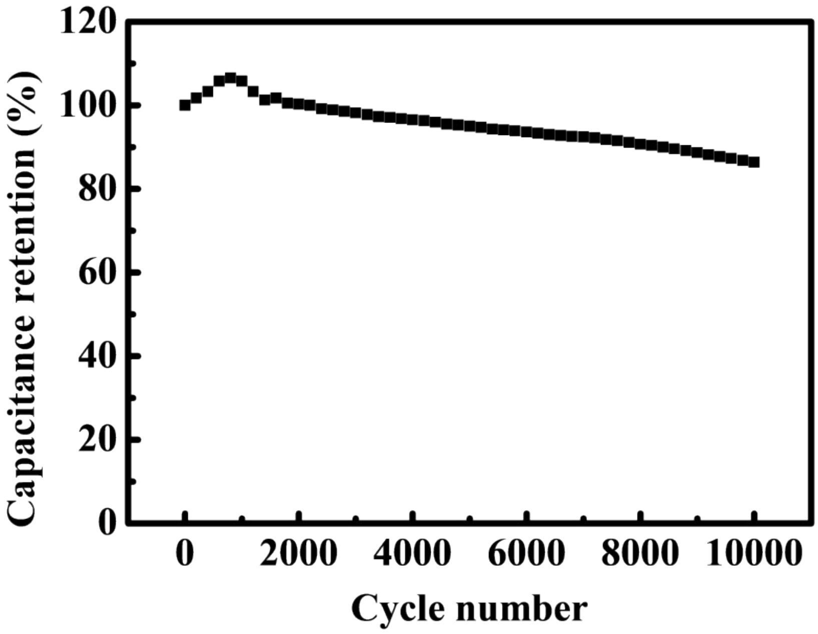

Fig. S12 Long-term cycling performance of the NiS-CA-2//CA device at a current density of 10 A g^{-1}.

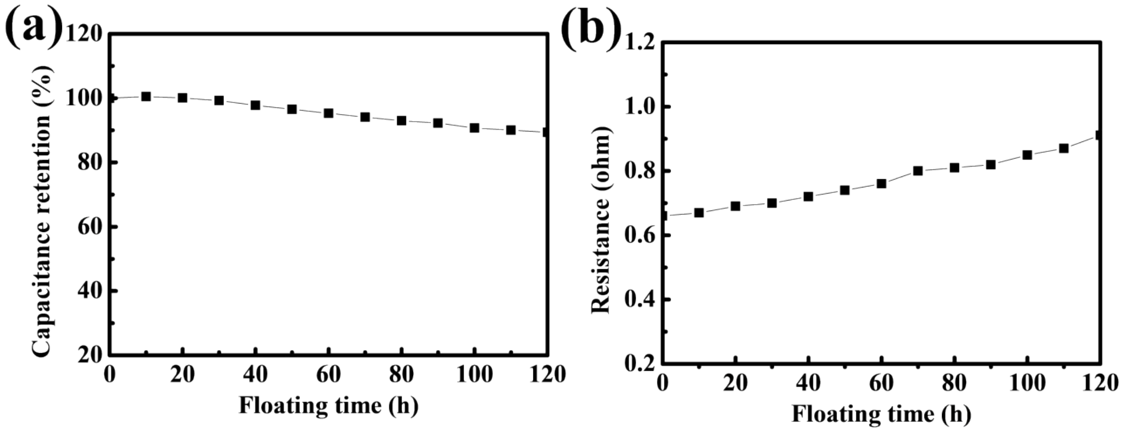

Fig. S13 (a) The specific capacitance retention and (b) resistance of NiS-CA-2//CA device as a function of floating time.

Floating test

The voltage-holding (floating) tests of the assembled device were carried out based on previous reported works[1-3]. The floating test is described as follows: after every 10 h of aging five galvanostatic charge-discharge cycles at the voltage of 1.4 V was followed and the specific capacitance was calculated from the first and fifth discharge respectively. These sequences were reiterated 12 times, i.e. a total floating time of 120 h.

References

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3 P. Ratajczak, K. Jurewicz and F. Beguin, J. Appl. Electrochem., 2014, 44, 475-480.