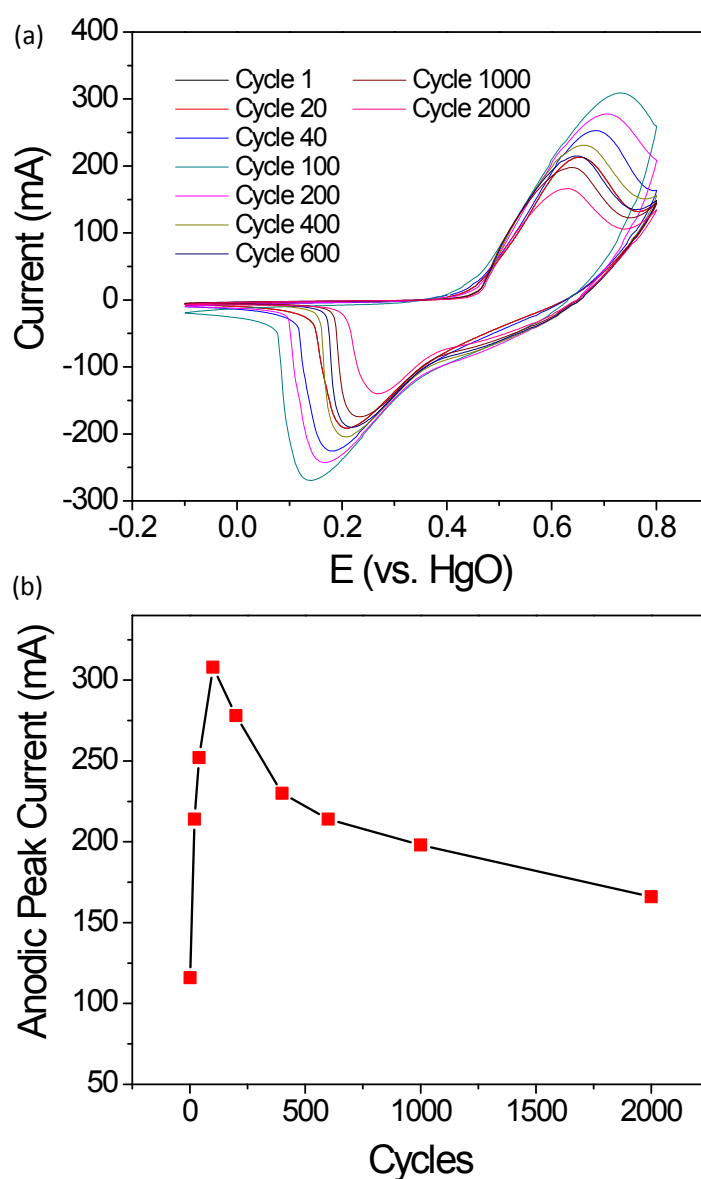# Electronic Supplementary Information

Cracks Bring Robustness: Pre-cracked NiO Nanosponge Electrode with Greatly Enhanced Cycle stability and Rate Performance

*Guoge Zhang*, Lan Wang, Yan Liu, Wenfang Li, Fei Yu, Wei Lu and Haitao Huang**

Figure S1. (a) CV (cyclic voltammetry) curves of PNC (porous nickel composite) at 100 mV s^{-1}. (b) The variation of anodic peak current with the cycle number.
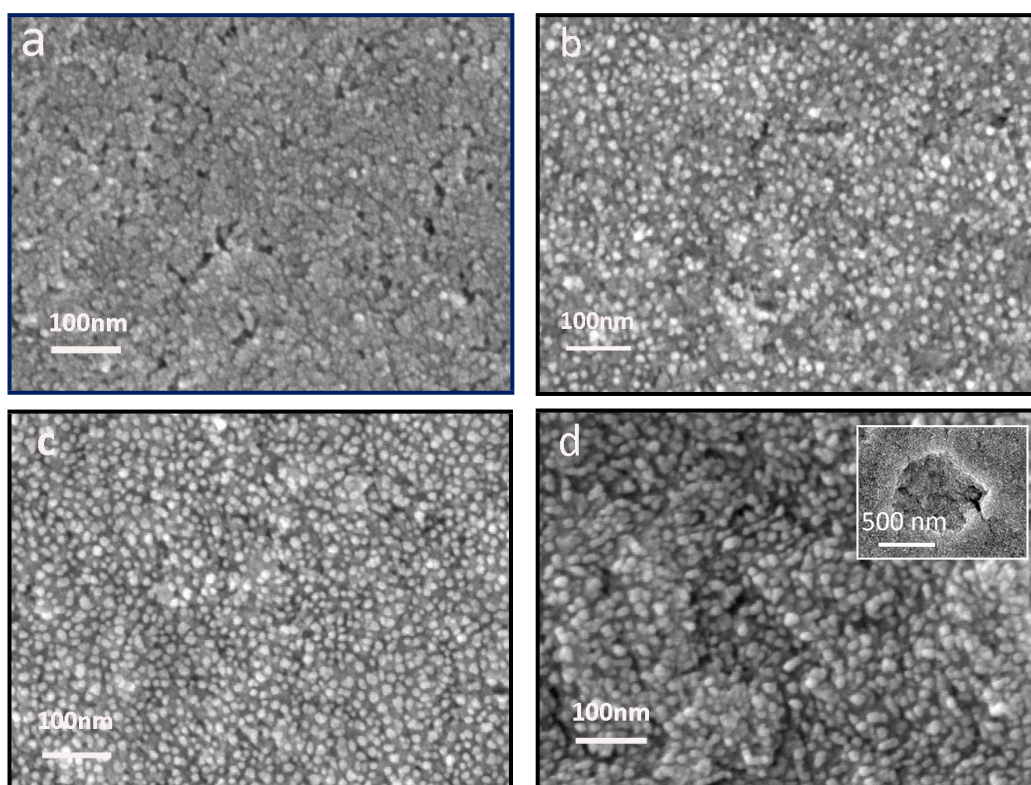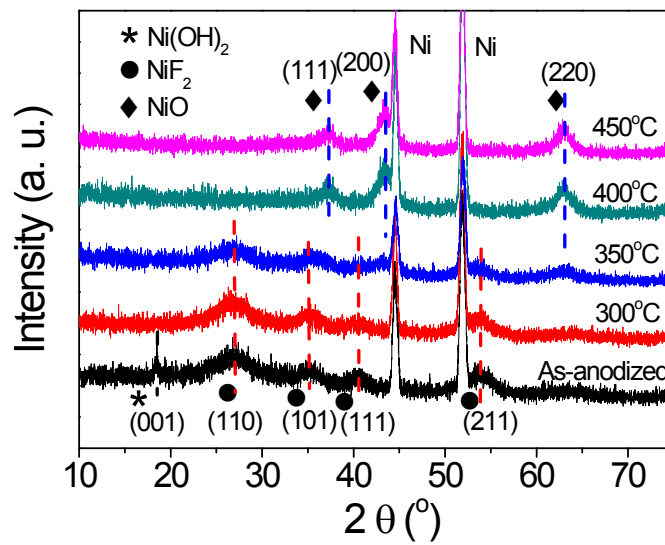
Figure S2. FESEM images of PNC after different cycles of CV test, (a) cycle 0; (b) cycle 20; (c) cycle 40; (d) cycle 600.

Table S1. Element content for PNC after different CV cycles
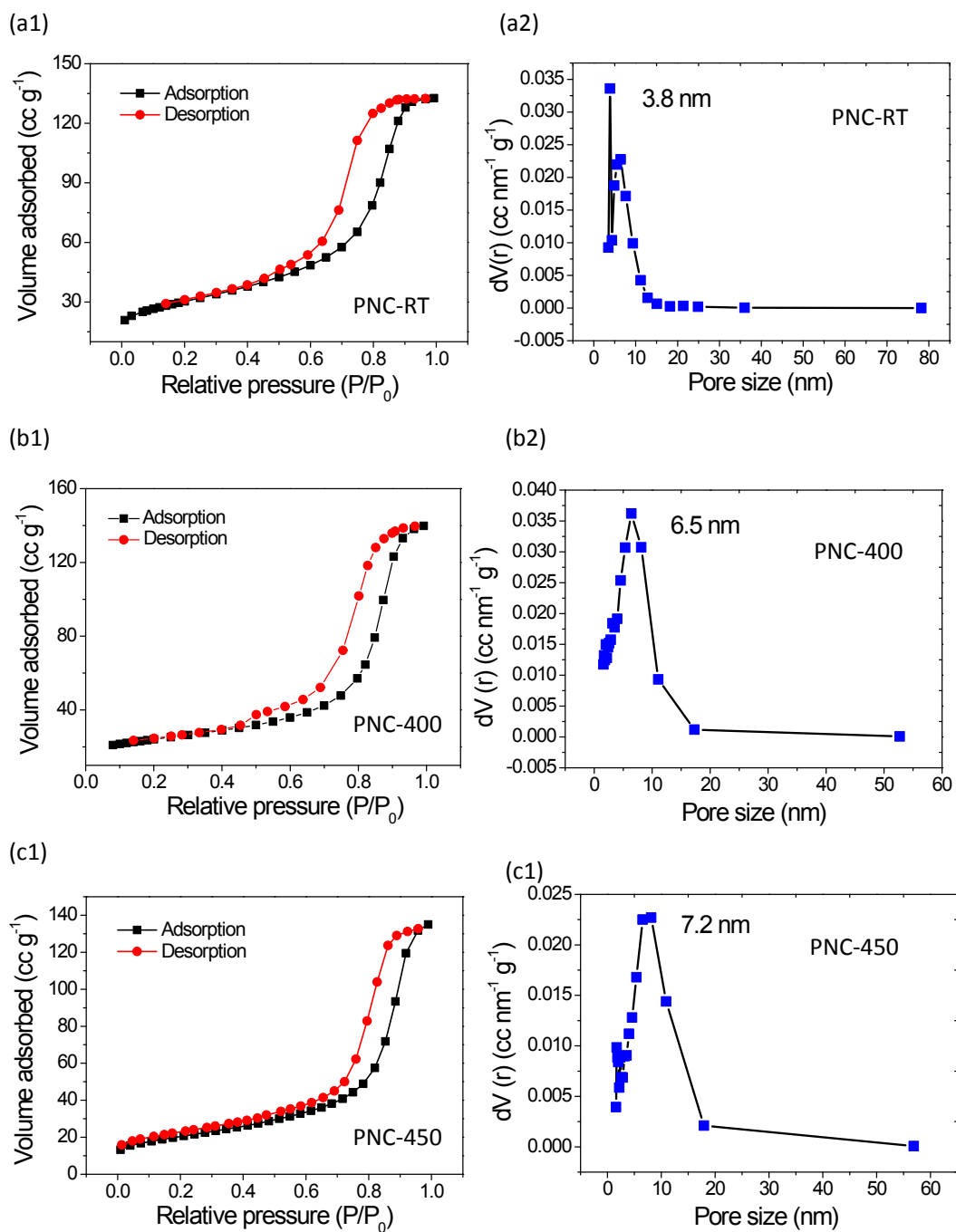
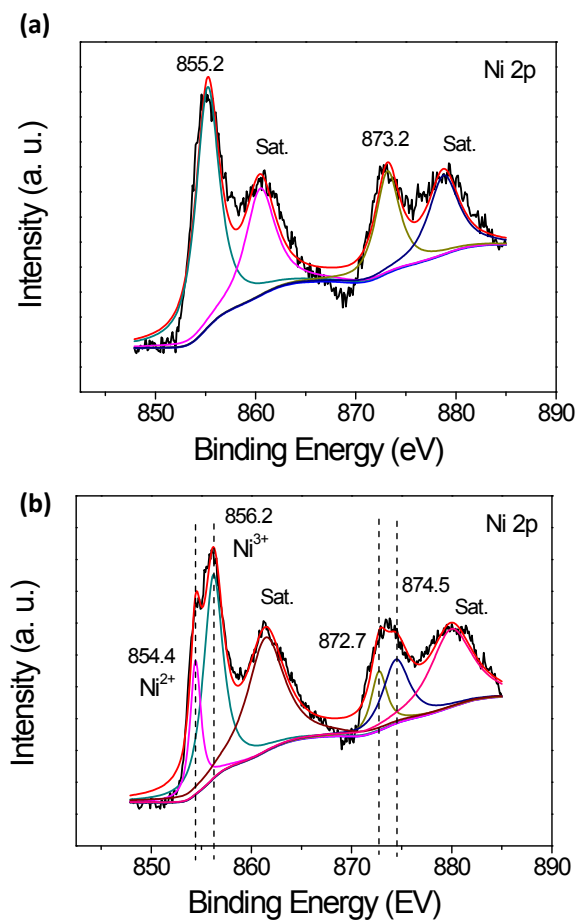| Element	Content (wt.%)			
	Cycle 0	Cycle 20	Cycle 40	Cycle 600
O	11.28	18.52	22.72	27.44
F	23.19	9.86	4.61	0
P	2.22	2.19	0	0
Ni	63.32	69.43	72.68	72.56
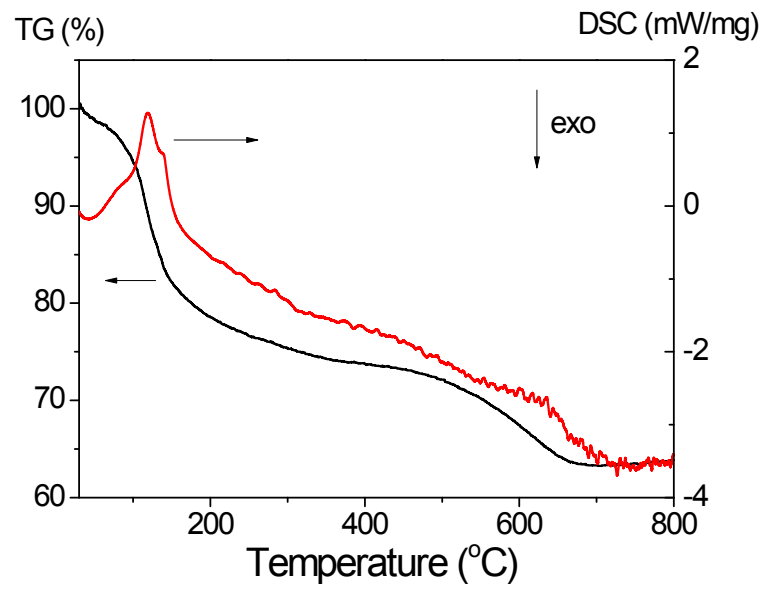
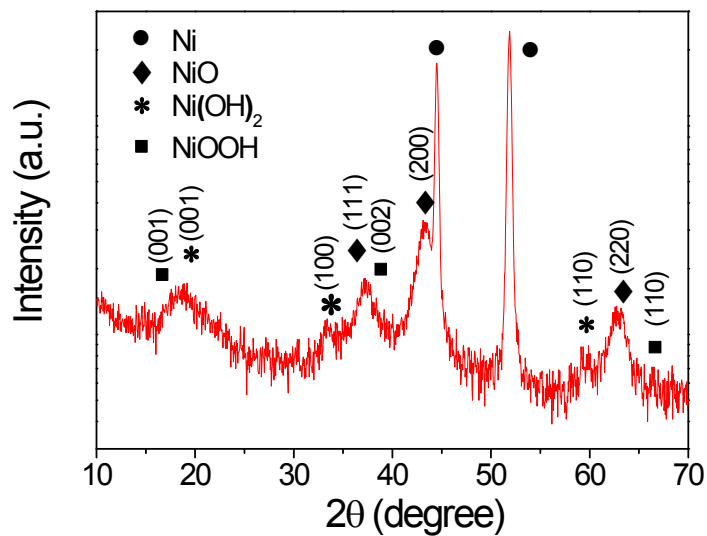**Figure S3.** TG and DSC curves of as-anodized PNC.

Figure S4. XRD result of as-anodized PNC and the samples after air annealing at different temperatures for 1 hour.
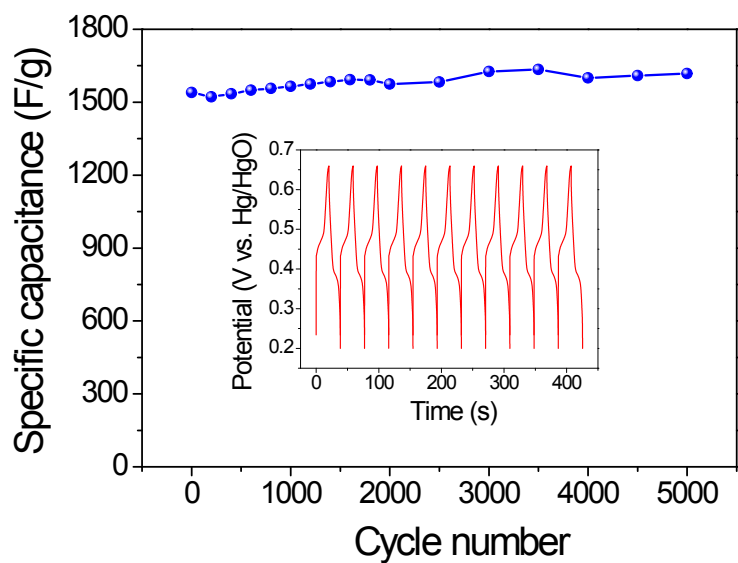
Figure S5. BET isotherm (a1, a2 and a3) and BJH pore size distribution (a2, b2 and b3) of anodic samples.

(a)

855.2

Ni 2p

Sat.

873.2

Sat.

Intensity (a. u.)

850   860   870   880   890

Binding Energy (eV)

(b)

856.2
Ni^{3+}

Ni 2p

Sat.

874.5

854.4
Ni^{2+}

872.7

Sat.

Intensity (a. u.)

850   860   870   880   890

Binding Energy (EV)

Figure S6. Ni 2p XPS (X-ray photoelectron spectroscopy) of PNC-400 (a) and PNC-600.

● Ni
◆ NiO
✳ Ni(OH)$_2$
■ NiOOH

(001)
✳(001)
✳(100)
◆(100)
(111)
(002)
◆(200)
●
●
✳(110)
◆(220)
■(110)

Intensity (a.u.)

10   20   30   40   50   60   70

2θ (degree)

Figure S7. XRD of PNC-600 after 200 CV cycles.

Figure S8. Galvanostatic charge/discharge (GCD) measurement of PNC-600 at 40 A g^{-1}. Inset: typical GCD curves during the test.

Table S2. Impedance components determined by fitting EIS experimental data using the equivalent circuit as shown in Figure 5d.

Material	Rs (ohm)	CPE-T (F)	CPE-P	Rct (ohm)	W1-R (ohm)	W1-T	W1-P
PNC-400	1.532	0.0085598	0.68645	6.36	3.888	0.83954	0.44073
PNC-600	1.488	0.011587	0.68382	3.547	0.93687	0.22972	0.45427