Experimental

Synthesis of porous α-$Ni(OH)_2$ microflowers:

0.5 g F127, 0.58 g $NiNO_3.6H_2O$, 0.24 g urea, and 100 ml water were magnetically stirred at room temperature for 2 hours. All the chemicals are used as received without purification. Then, the mixture was autoclaved at 90 ^oC for 10 hrs. The green precipitate of $Ni(OH)_2$ was collected and washed with ultrapure water several times the final products were dried in an oven at 50 ^oC and calcined for 4 hrs at different temperatures at the ramping rate of 1 ^oC.

Characterization:

X-ray diffraction patterns of the material were measured by X-ray difractometer with graphite monochromator and Cu-Kα radiation (λ = 0.15418) while the voltage and electric current were held at 40 kV and 40 mA. The morphology of microstructures was characterized by field-emission scanning electron microscopy (FE-SEM, Hitachi S-8000) and Transmission electron microscopy (TEM, JEM-2100F TEM). N_2 adsorption/desorption was determined by using Quantachrom surface area analyzer. A simultaneous thermogravimetric analysis (TGA) and a differential thermal analysis (DTA) were carried using SII Exstar-6000 at the heating rate of 10 °C/min in air.

Electrochemical measurements

5 mg of the dried sample was mixed with 10 wt % of polyvinylidene fluoride (PVdF). 35 μL of N-methyl-2-pyrrolidone (NMP) was added to 0.5 mg of the mixed powder to synthesize the coating slurries. The graphite substrate was cut into 10mm×10mm×3mm pieces and cleaned ultrasonically using 0.5 M H_2SO_4. The cleaned graphite substrate was dried in a reduced pressure oven at 80 ◦C overnight. The slurry was coated on the graphite surface and the other exposed parts were covered with polytetrafluoroethene (PTFE). The prepared graphite was used to prepare the working electrode in this study. The electrochemical experiments were characterized by cyclic voltammetry using a three-electrode setup with a platinum (Pt) wire counter electrode, silver chloride (Ag/AgCl) reference electrode, and the $Ni(OH)_2$ or NiO working electrode. The cyclic voltammetry experiments were carried out on an electrochemical workstation (CHI-842BZ). The capacitance values were calculated by using the following equation.

$$C = \frac{Q}{\Delta V} = \frac{1}{m\nu(V_a - V_c)} \int_{V_c}^{V_a} I(V)dV$$

The capacitance was calculated by integrating the area under the CV curve to obtain the charge (Q) and then dividing by the mass of electroactive materials (m), the scan rate (v), and the potential range ($\Delta V = V_a$-V_c). The equation above can be simplified as the following equation.

$$C = \frac{\int I\,dt}{m\Delta V}$$

Table S1 Comparison of various published results on $NiO/Ni(OH)_2$ -based supercapacitors.

Sample	Potential range/V	Scan rate/mV s^{-1}	Electrolyte	Capacitance/Fg^{-1}	Refs
$Ni(OH)_2$	0 to 0.6	5	1M KOH	469	This work
$Ni(OH)_2$	0 to 0.55	5	1M KOH	740	S1
$Ni(OH)_2$	0 to 0.55	5	1M KOH	221~805	S2
NiO	-0.2 to 0.3	5	1M KOH	320	S3
$Ni(OH)_2$	-1.0 to 0.9	10	1M Na_2SO_4	53	S4
$Ni(OH)_2/MnO_2$			1M Na_2SO_4	355	
$Ni(OH)_2$	-0.2 to 0.5	5	2M KOH	265	S5
$Ni(OH)_2$	0 to 0.6	10	2M KOH	96	S6
$Ni(OH)_2$/Zeolite			2M KOH	583	
$Ni(OH)_2$	0 to 0.65	2.5	3M KOH	578	S7
$Ni(OH)_2$	-1.0 to 0	2	6M KOH	314.5	S8

References:

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S2) J. W. Lee, J. M. Ko, and J. D. Kim, *J. Phys. Chem. C*, 2011, **115**, 19445.

S3) J. Li, W. Zhao, F, Huang, A. Manivannan, and N. Wu, *Nanoscale*, 2011, **3**, 5103.

S4) H. Jiang, C. Li, T. Sun, and J. Mab, *Chem. Commun*., 2012, **48**, 2606.

S5) Y. Ren and L. Gao, *J. Am. Ceram. Soc.,* 2010, **93**, 3560.

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S7) D. D. Zhao, S. J. Bao, W. J. Zhou, H. L. Li *Electrochem. Commun.,* 2007, **9**, 869.

S8) Q. H. Huang, X. Y. Wang, J. Li, C. L. Dai, S. Gamboa and P. J. Sebastian, *J. Power Sources*, 2007, **164**, 425.

Fig. S1

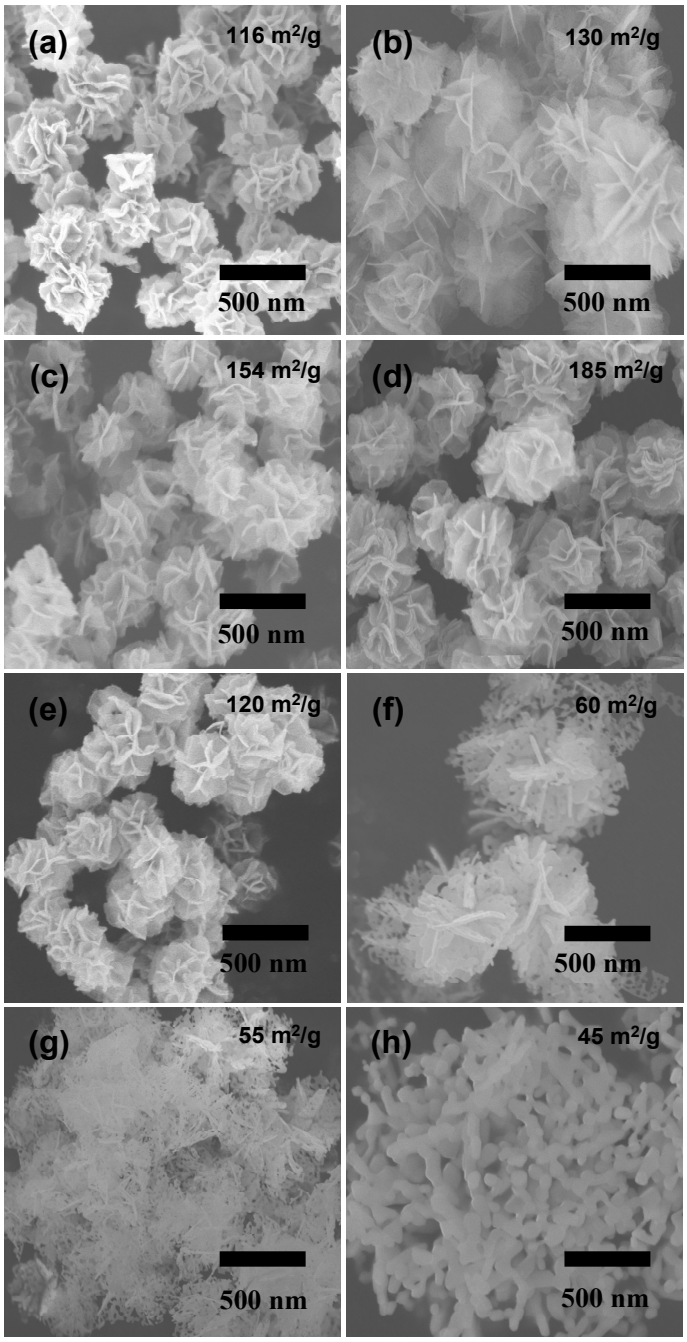

Fig. S1 SEM images of the samples calcined at different temperatures. ((a) as-prepared, (b) $Ni(OH)_2$-100 ^oC, (c) $Ni(OH)_2$-200 ^oC, (d) NiO-300 ^oC, (e) NiO-400 ^oC, (f) NiO-500 ^oC, (g) NiO-600 ^oC, and (h) NiO-700 ^oC). The surface areas measured by BET method are also noted.

Fig. S2

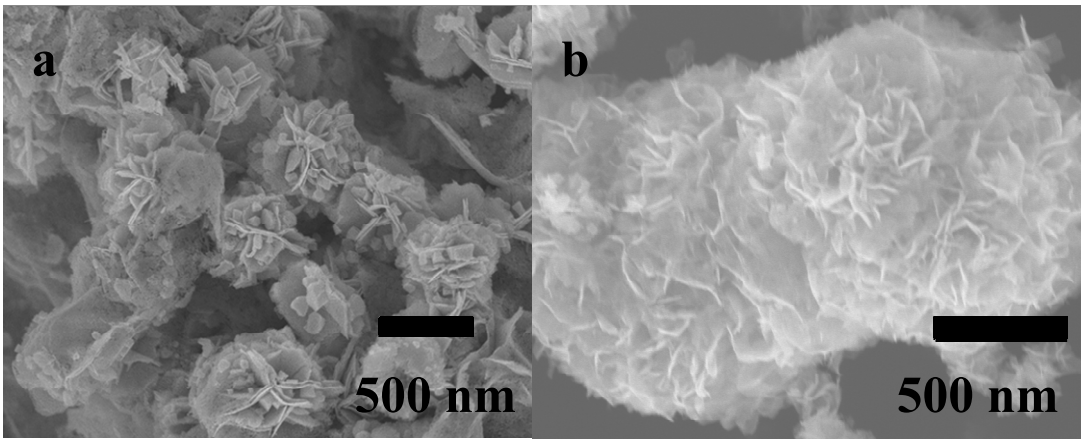

Fig. S2 SEM image of α-$Ni(OH)_2$ prepared under different polymer concentrations ((a) 0.1 $g \cdot L^{-1}$ and (b) 30 $g \cdot L^{-1}$).

Fig. S3

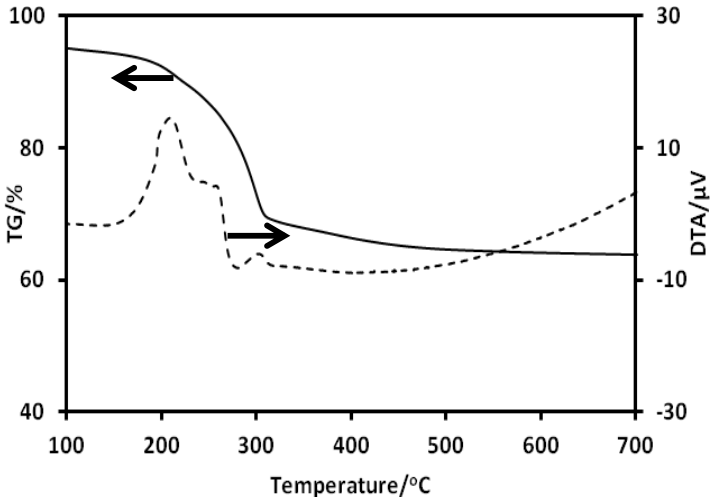

Fig. S3 TG-DTA curves for the as-prepared $Ni(OH)_2$ microflowers before removal of surfactants.

Fig. S4

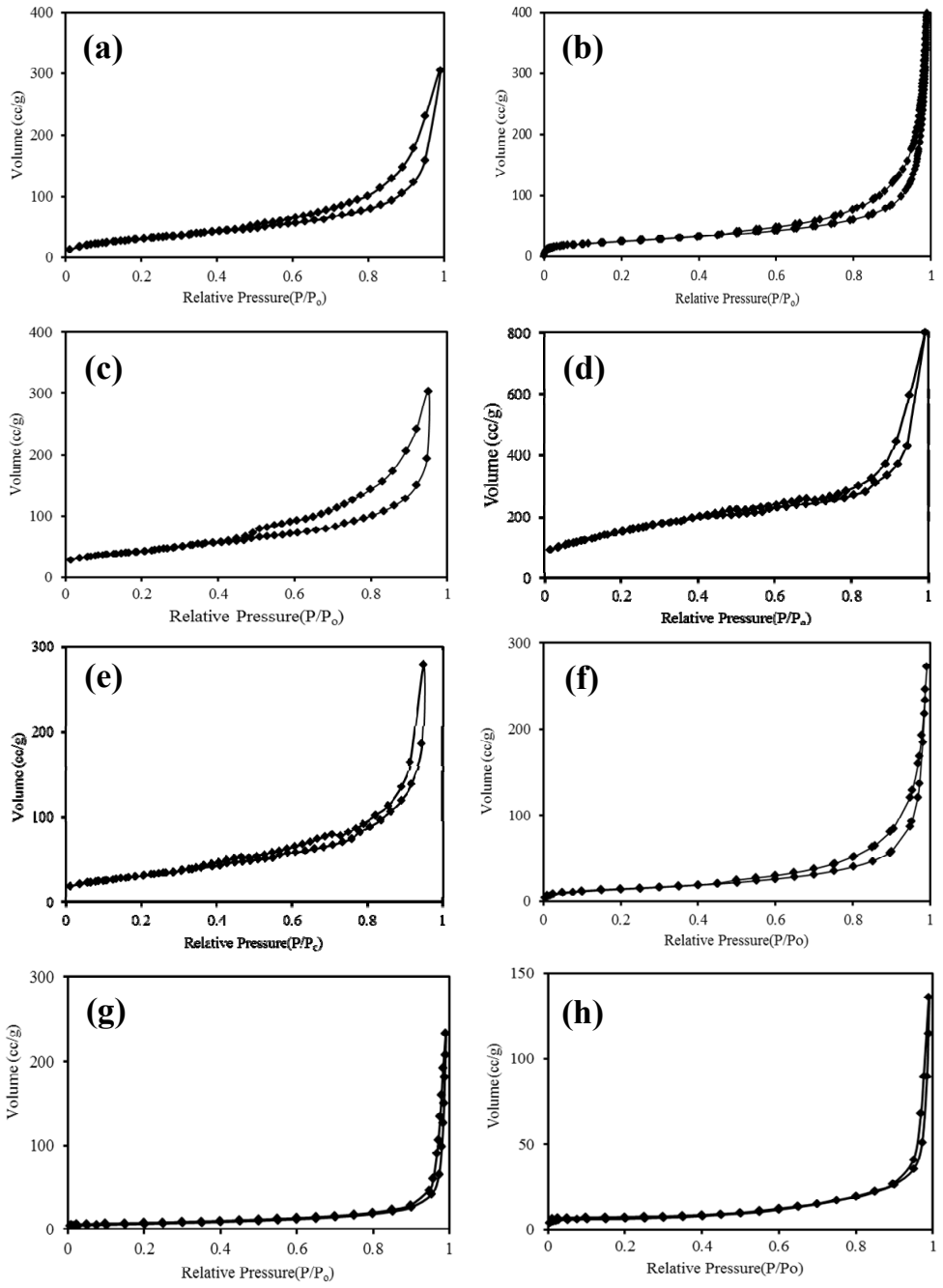

Fig. S4 N_2 adsorption isotherm of the samples calcined at different temperatures. ((a) as-prepared, (b) $Ni(OH)_2$-100 ^oC, (c) $Ni(OH)_2$-200 ^oC, (d) NiO-300 ^oC, (e) NiO-400 ^oC, (f) NiO-500 ^oC, (g) NiO-600 ^oC, and (h) NiO-700 ^oC).