Supporting Information

Biomass-derived nitrogen and sulfur co-doped sheet-like porous carbon for high-performance supercapacitors

Kun-Lang Lu [a], Xian-Yong Wei [a,b,c,*], Fa-Zhan Mao [a], Zhi-Juan Zhu [d], Zhuang Li [a], Fan Yin [a], Jia-Hao Li [a], Zhi-Min Zong [a]

[a] *Jiangsu Province Engineering Research Center of Fine Utilization of Carbon Resources and Key Laboratory of Coal Processing and Efficient Utilization, Ministry of Education, China University of Mining & Technology, Xuzhou 221116, Jiangsu, China*

[b] *State Key Laboratory of High-efficiency Coal Utilization and Green Chemical Engineering, Ningxia University, Yinchuan 750021, Ningxia, China*

[c] *State Key Laboratory of Chemistry and Utilization of Carbon-Based Energy Resources Jointly Built by Xinjiang Uyghur Autonomous Region and Ministry of Science and Technology, Key Laboratory of Coal Clean Conversion & Chemical Engineering Process (Xinjiang Uyghur Autonomous Region), College of Chemical Engineering, Xinjiang University, Urumqi 830046, Xinjiang, China*

[d] *Canadian Solar Sunenergy (Suqian) Co., Ltd. Suqian 223800, Jiangsu, China*

* Corresponding author.

Tel: +86-516-83885951; Fax: +86-516-83884399.

E-*mail address*: wei_xianyong@163.com. (X. Y. Wei)

Electrode Preparation and Electrochemical Measurements

Each working electrode was prepared by coating a mixture containing carbon material (80 wt%), polytetrafluoroethylene (10 wt%), acetylene black (10 wt%), and appropriate amount of ethanol onto nickel foam (1 × 1 cm, pressurized under 10 MPa for 5 min, and then dried overnight under vacuum at 70 °C. In the three-electrode system, saturated calomel electrode, platinum electrode, and 6 M KOH solution were used as reference electrode, counter electrode, and electrolyte, respectively. For the two-electrode configuration, symmetric supercapacitors were assembled from two identical

* Corresponding author. Tel: +86-516-83885951; Fax: +86-516-83884399.
E-*mail address*: wei_xianyong@163.com.

electrodes in 6 M KOH aqueous electrolyte. GSCDC and cycling stability measurements were carried out on the CT-4000 battery testing system. CV and electrochemical impedance spectroscopy (ESI) measurements were performed using Chenhua CHI660E electrochemical workstation.

GMSC, ED, and PD were calculated using the equations: GMSC = $I\triangle t/(m\triangle V)$, ED = GMSC$\triangle V^2/7.2$, and PD = 3600ED/$\triangle t$, where I, t, m, and $\triangle V$ denote discharge current, discharge time, active material mass, and working voltage range, respectively.

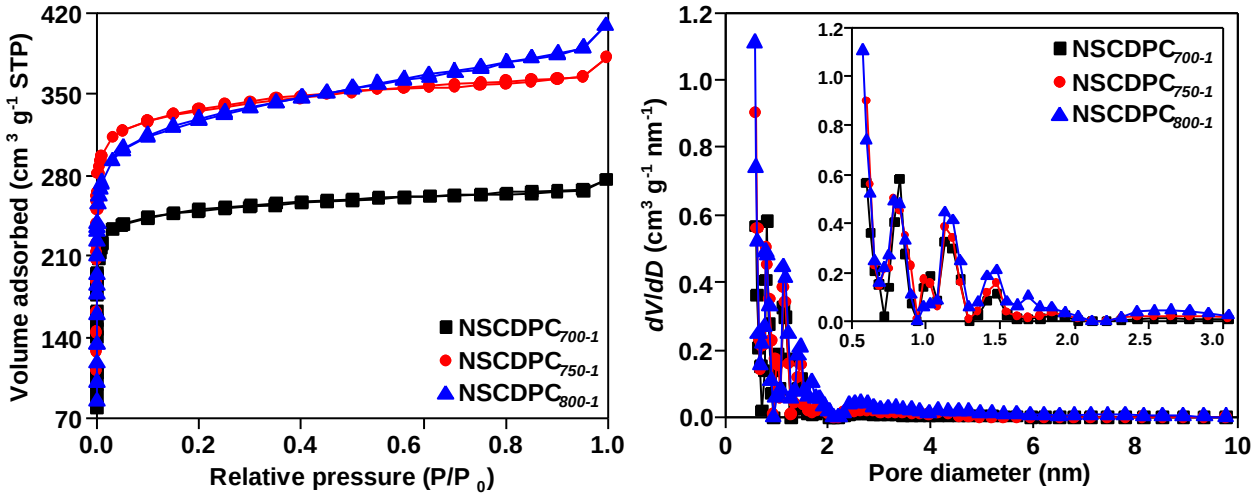

Fig. S1. N_2 adsorption/desorption isotherms (left) and pore size distribution curves (right) of the sample.

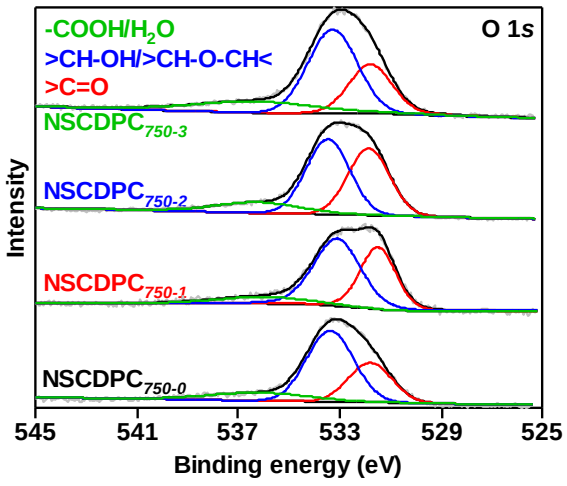

Fig. S2. XRPES of the samples.

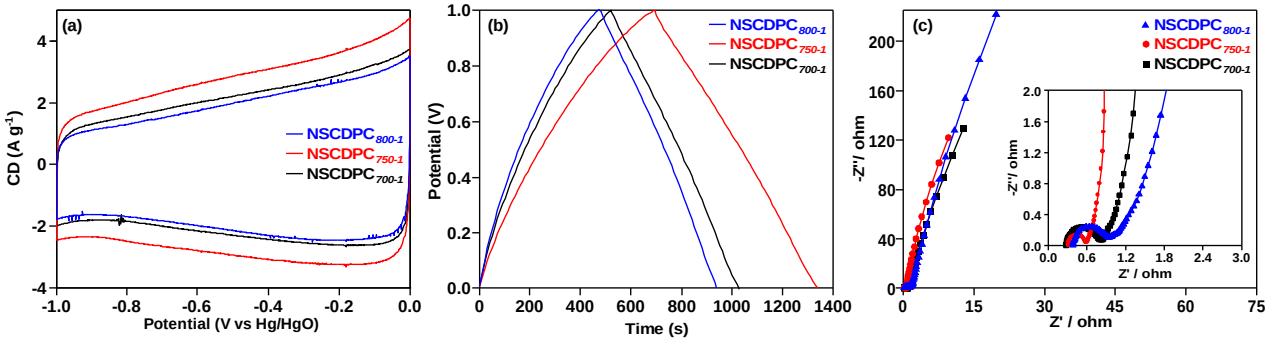

Fig. S3. CV curves at 10 mV s^{-1} (a), GSCDC curves at 0.5 A g^{-1} (b), and Nyquist points (c) of the samples.

Table S1 SSA and Pore Parameters of the Samples

Sample	SSA (m^2 g^{-1})	PV (cm^3 g^{-1})		APDM (nm)
		Total	Micropore	
NSCDPC*700-1*	1176	0.52	0.46	1.80
NSCDPC*750-1*	1429	0.56	0.52	1.78
NSCDPC*800-1*	1213	0.55	0.47	2.07

Table S2 Relative Contents of Different Species

Species	Relative Content (%)			
	NSCDPC*750-0*	NSCDPC*750-1*	NSCDPC*750-2*	NSCDPC*750-3*
Carbon				
>**C**=**C**</>**C**H-**C**H<	48.0	40.8	47.7	46.0
>**C**H-N<	20.6	23.7	20.7	21.7
>**C**H-O-	9.2	9.8	8.3	10.8
>**C**=N-/>**C**=O	7.0	11.7	11.5	7.7
O=**C**H-O-	15.2	14.0	11.8	13.8
Oxygen				
>C=**O**	29.1	36.9	39.6	28.1
>CH-**O**H/>CH-**O**-CH<	57.1	53.6	46.5	51.7
-C**OO**H/H_2**O**	13.8	9.5	13.9	20.2
Nitrogen				
PN^{I}	-	15.8	24.6	18.8
PN^{II}	-	26.9	25.0	21.1
QN	-	32.1	33.8	28.2
NOs	-	25.2	16.6	31.9
Sulfur				
S $2p_{3/2}$	30.5	13.0	37.6	37.9
S $2p_{1/2}$	28.0	23.0	22.8	29.0
>CH-**S**O_X-CH<	41.5	64.0	39.6	33.1