Electronic Supplementary Information

Nitrogen-doped hierarchical porous CNF derived from fibrous structured hollow ZIF-8 for high-performance supercapacitor electrode

Hongjiao Nie, [*a] Kan Mi, [a] Lanlan Song [a] and Xiuwen Zheng [*a]

[a] Key Laboratory of Functional Nanomaterials and Technology in Universities of Shandong, School of Chemistry and Chemical Engineering, Linyi University, Linyi 276000, China

Fax: +86-0539-7258151

E-mail: niehongjiao2011@163.com, zhengxiuwen@lyu.edu.cn

Experimental section

Preparation of ZIF-8 derived nitrogen doped porous carbon

ZIF-8 was synthesized using the following procedure: initially, 0.8 g $Zn(AC)_2.2H_2O$ was dissolved in 5 mL deionized water and stirred for 10 min. Then, 5 mL deionized water, containing 1.12 g dimethylimidazole (2MI), was added slowly and stirred for 30 s at room temperature. After 24 h's standing, the white product was centrifuged, wash with deionized water several times and dried at 70 °C to obtain ZIF-8 particle. Afterwards, ZIF-8 particle was carbonized at 1073 K for 2 h at a heating rate of 5 K min^{-1} under Ar atmosphere, and washed with HCl (2 mol L^{-1}) for 24 h under vigorous stirring at room temperature.

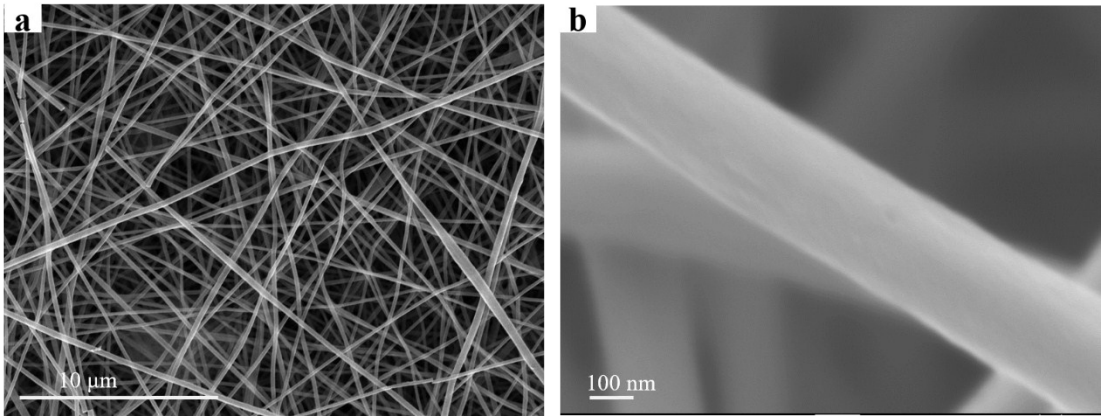

Figure S1. SEM images of CNF.

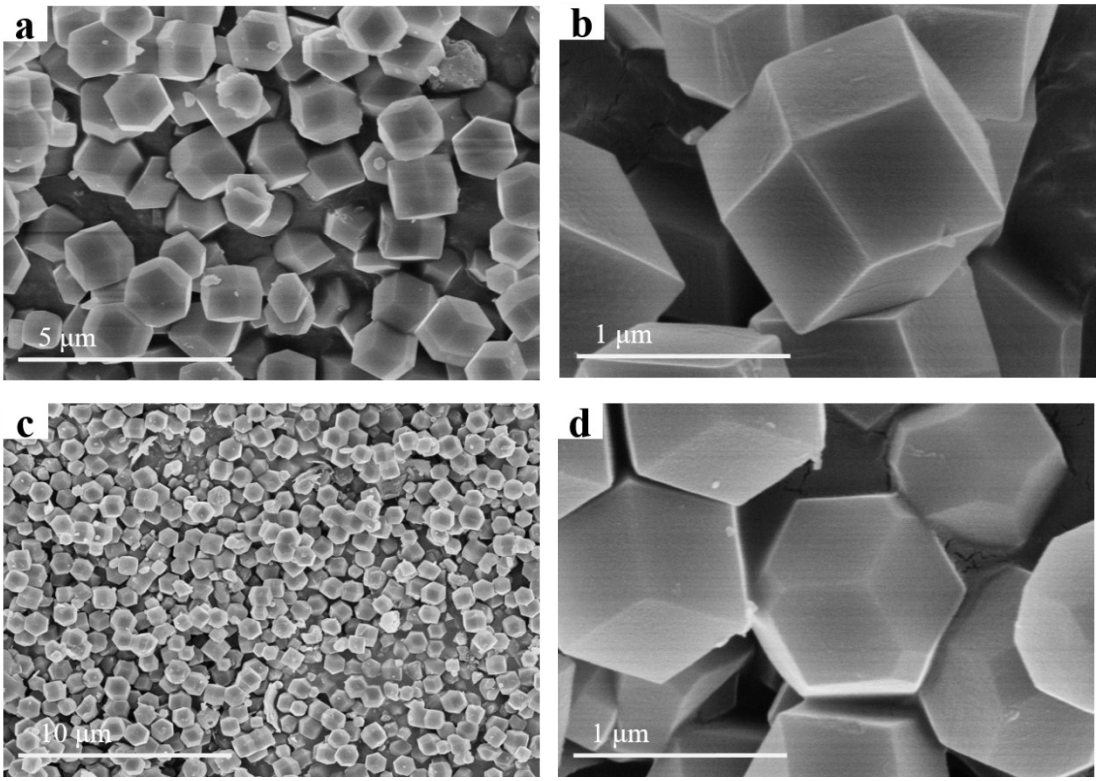

Figure S2. SEM images of ZIF-8 (a, b) and ZIF-8 derived N doped porous carbon (c, d).

Sample	N-6	N-5	Quaternary N	Pyridine N-oxide
N-HPCNF	59.6%	35.6%	4.8%	0
CNF	0	28%	54.2%	17.8%

Table S1. Detail breakdown of N1s signal showing relative composition of different surface nitrogen groups.

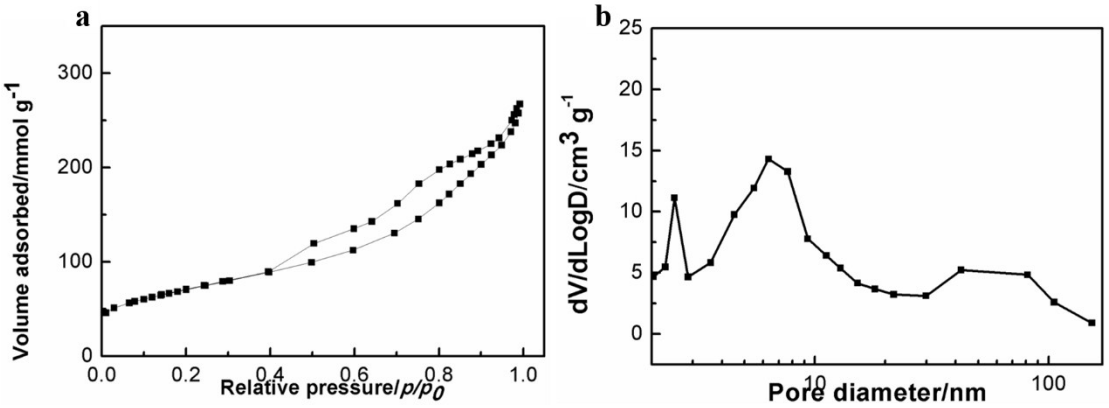

Figure S3. N_2 adsorption/desorption isotherms and the corresponding pore-size-distribution curve of N-HPCNF.

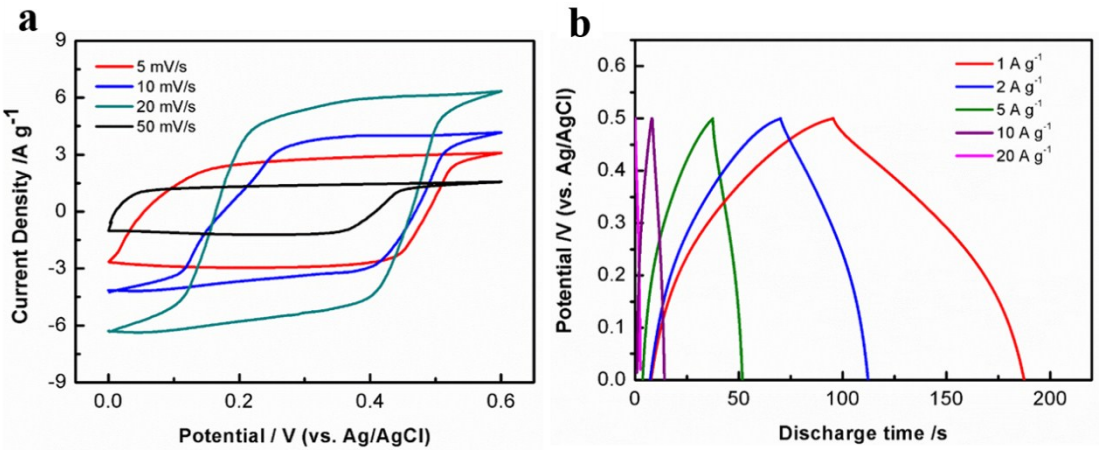

Figure S4. CV curves (a) and galvanostatic charge-discharge curves (b) for ZIF-8 derived carbon.

Electrode	Electrolyte	Highest capacitance ($F\ g^{-1}$)	Lowest capacitance (F g-1)	Rate capability (%)	Reference
Hierarchical porous carbon microbeads	6 M KOH	320 (0.05 A g^{-1})	193 (100 A g^{-1})	60.3	S1
N-doped carbon spheres	6 M KOH	356 (0.2 A g^{-1})	196 (10 A g^{-1})	55.1	S2
3D nitrogen doped carbon networks	6 M KOH	304 (0.5 A g^{-1})	226 (20 A g^{-1})	74.3	S3
3D beehive-like hierarchical porous carbon	6 M KOH	314 (0.5 A g^{-1})	237 (20 A g^{-1})	75.5	S4
Bagasse waste-derived hierarchical porous carbon	6 M KOH	320 (0.5 A g^{-1})	227 (50 A g^{-1})	70.9	S5
GO-induced layered porous carbon	6 M KOH	455 (0.5 A g^{-1})	221 (3 A g^{-1})	48.6	S6
Honeycomb-like porous carbon	6 M KOH	342 (0.2 A g^{-1})	212 (20 A g^{-1})	62	S7
Flour-derived honeycomb-like carbon foam	6 M KOH	473 (0.5 A g^{-1})	275 (20 A g^{-1})	58.1	S8

Table S2. Summary of the rate performance of some carbon electrodes.

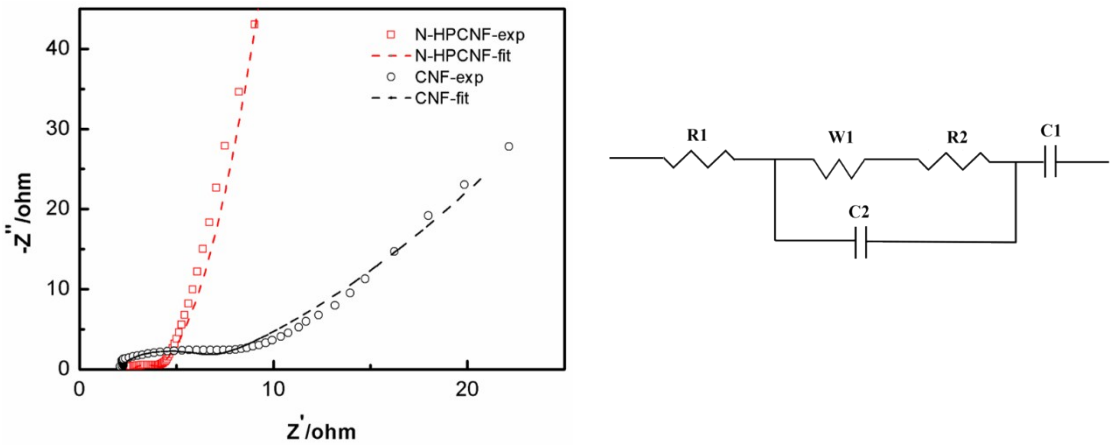

Figure S5. The fitted Nyquist plots and equivalent circuit of N-HPCNF and CNF.

R1 is the equivalent internal resistance, including resistance of the electrolyte and the internal resistance of the electrode; W1 is the Warburg diffusion element; and R2 is charge transfer resistance.

Reference

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