Supporting Information

Spherical Nitrogen-doped Hollow Mesoporous Carbon as an Efficient Bifunctional Electrocatalyst for Zn-Air Batteries

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Fig. S1. Energy dispersive X-ray spectrum for HMC.



Fig. S2. XPS survey spectrum for HMC.



Fig. S3. TEM bright field images of polydopamine beads (A, B).



Fig. S4. Nitrogen adsorption-desorption isotherms for HMC.



Fig. S5. Nitrogen adsorption-desorption isotherms for Silica@mC spheres.



Fig. S6. Nitrogen adsorption-desorption isotherms for polydopamine beads.



Fig. S7. (A) LSV curves for Silica@mC in an O_2 -saturated 0.1 M KOH solution at indicated rotational rates and a scan rate of 10 mV s⁻¹. (B) K-Lplots for Silica@mC in the potential range of -0.3 to -0.7 V vs. Hg/HgO.



Fig. S8. (A) LSV curves for PDA beads in an O_2 -saturated 0.1 M KOH solution at indicated rotational rates and a scan rate of 10 mV s⁻¹. (B) K-L plots for PDA beads in the potential range of -0.3 to -0.7 V vs. Hg/HgO.

References	Materials	Onset potential (V)	Cathodic ORR peak potential (V)	Max Current density at 1600 rpm (mA cm ⁻²)	Mass loading (mg cm ⁻²)
This study	Nitrogen doped-HMC	-0.050	-0.230	4.95	0.1
Nanoscale, 2015, 7, 1501	Fe/N/C hollow nanospheres	ND	-0.070	ND	0.2
Nanoscale, 2014, 6, 15080	Co- nanoparticles in N-doped carbon	-0.040	-0.140	5.29	0.2
Angew. Chem. 2013, 125, 3192 -3198	N-doped graphene	-0.319	-0.389	2.42	ND
Adv. Mater. 2013, 25, 998- 1003	N-rich PD Abased carbon	-0.001	-0.120	ND	ND
J. Am. Chem. Soc. 2012, 134, 16127	P-doped ordered mesoporous carbons	-0.060	ND	1.70	0.7
Chem. Commun., 2015, 51, 8841	Eggplant- derived microporous carbon sheets	-0.003	-0.120	2.45	ND
Nature Communication, 2014, 1-24	N-doped Hierarchically porous carbon	ND	-0.140	4.32	0.5
Nanoscale, 2014, 6, 3540	NiCo ₂ S ₄	-0.050	-0.120	4.30	0.7

Table S1. Comparison of the ORR activity of HMC with various non-precious metal catalysts in the recent literature

ND: Not determined.

* All the potentials are expressed vs. the Hg/HgO reference electrode.

References	Materials	Charge potential (V)	Discharge potential (V)	Mass loading (mg cm ⁻ ²)
This study	Nitrogen doped-HMC	2.13	1.24	1
This study	Pt/C	2.20	1.15	1
Nat.nano, 2015, 5, 444-452	N and P co-doped mesoporous nanocarbon	~2.5	~0.95	0.50
Chem. Commun., 2015, 51, 8841	Eggplant-derived microporous carbon sheets	~2.2	1.23	ND
Nano Lett. 2012, 12, 1946–1952	LiNO ₃ /CNT	2.33	0.94	0.72

Table S2. Comparison of the rechargeable ZAB performance of HMC with various non-precious metal catalysts in the recent literature

ND: Not determined.