Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

N-doped porous biocarbon materials derived from soya peptone as efficient electrocatalysts for ORR†

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Figures and captions

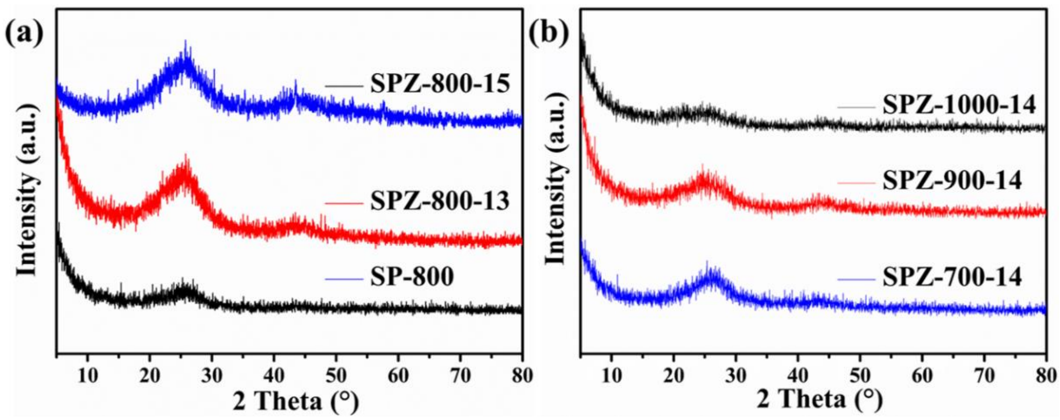

Figure S1. XRD patterns of SP-800, SPZ-800-13, SPZ-800-15, SPZ-700-14, SPZ-900-14, and SPZ-1000-14.

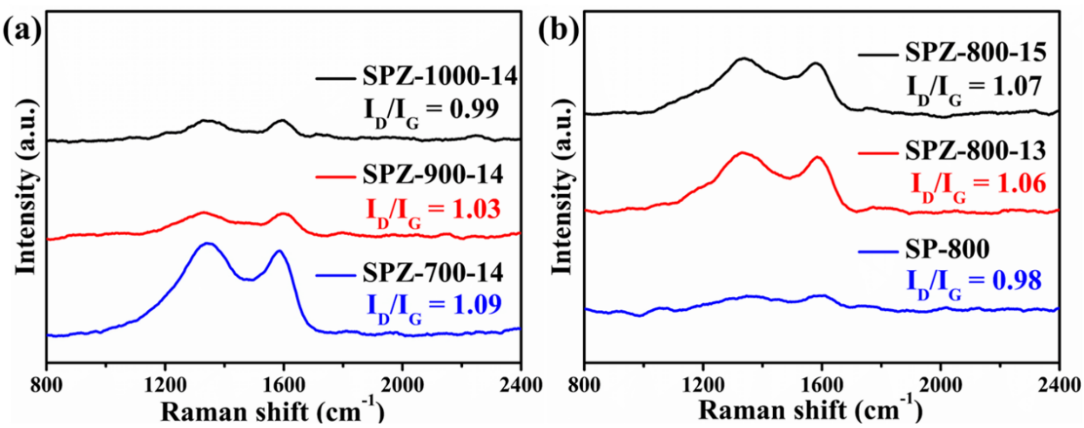

Figure S2. Raman spectra of SP-800, SPZ-800-13, SPZ-800-15, SPZ-700-14, SPZ-900-14, and SPZ-1000-14.

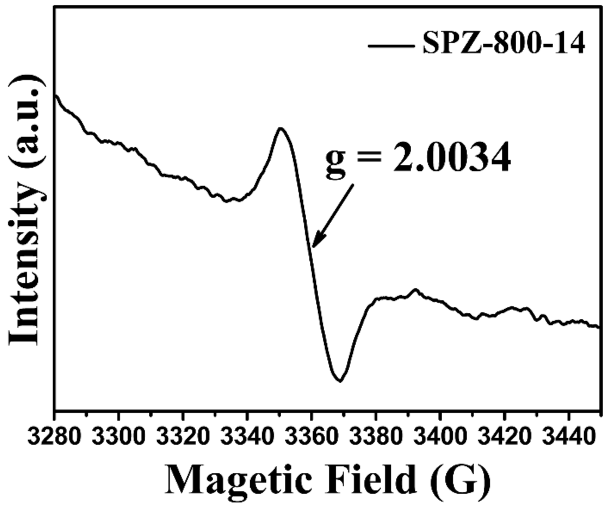

Figure S3. EPR spectra of SPZ-800-14.

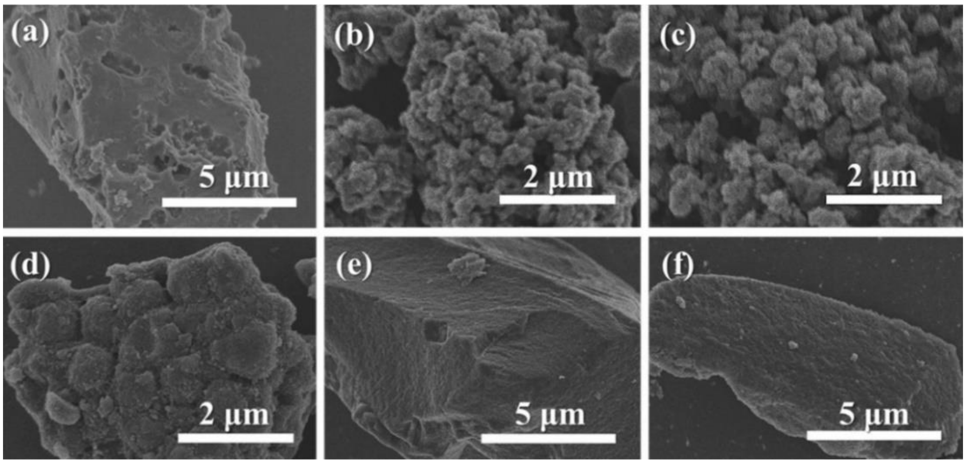

Figure S4. SEM of (a) SP-800, (b) SPZ-800-13, (c) SPZ-800-15, (d) SPZ-700-14, (e) SPZ-900-14, and (f) SPZ-1000-14.

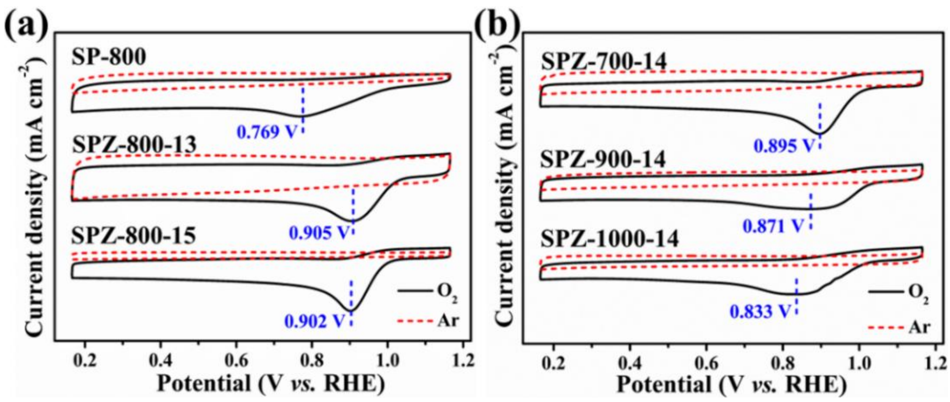

Figure S5. Cyclic voltammetry (CV) curves of SP-800, SPZ-800-13, SPZ-800-15, SPZ-700-14, SPZ-900-14, and SPZ-1000-14 for ORR measured in Ar- and O_2- saturated 0.1 M KOH electrolyte.

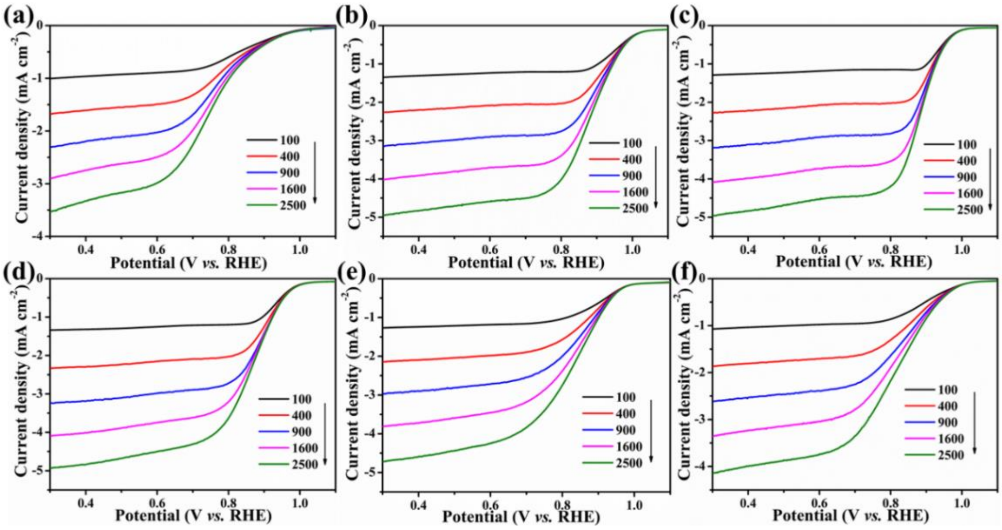

Figure S6. The ORR catalytic activities of (a) SP-800, (b) SPZ-800-13, (c) SPZ-800-15, (d) SPZ-700-14, (e) SPZ-900-14, and (f) SPZ-1000-14 evaluated by LSV tests at different rotation rates (from 100 rpm to 2500 rpm) with a scan rate of 10 mV·s^{-1} in O_2- saturated 0.1 M KOH electrolyte.

Table S1. The ORR parameters compared with the catalysts in the paper.

Catalysts	E_{onset} (V *vs*. RHE)	$E_{1/2}$ (V *vs*. RHE)	J_L (mA cm^{-2})
SPZ-800-14	1.02	0.894	4.56
SP-800	0.871	0.751	2.89
SPZ-800-13	0.999	0.889	4.02
SPZ-800-15	0.985	0.887	4.09
SPZ-700-14	0.979	0.871	4.09
SPZ-900-14	0.957	0.835	3.81
SPZ-1000-14	0.946	0.818	3.36

Table S2. The ORR parameters compared with state-of-the-art ORR catalysts in the literature.

Catalysts	E_{onset} (V *vs*. RHE)	$E_{1/2}$ (V *vs*. RHE)	J_L (mA cm^{-2})	Ref.
SPZ-800-14	1.02	0.894	4.56	This work
SA-Zn-NHPC	1.00	0.87	5.85	[1]
NCN-7	0.99	0.87	5.5	[2]
WC-3-0.8	0.98	0.875	6.08	[3]
Zn-S-N-C	0.962	0.894	-	[4]
NHPC-0.5	1.004	0.883	3.4682	[5]
G1000-ZC-2.0	1.03	0.885	6.2	[6]
Zn–N–C	-	0.873	-	[7]
DANC-800-138	0.985	0.813	-	[8]
CTF-Super P-10	0.981	0.883	5.31	[9]
WHCR-Zn	0.93	0.80	-	[10]
DZ14	0.894	-	-	[11]
PG300Z-800	0.98	0.8	3.1	[12]
RZ9	0.91	-	-	[13]
N/PC-800	0.958	0.799	3.99	[14]
FS350Z-900	1.00	-	-	[15]
WHC-700	0.98	-	4.15	[16]
THNC-800	0.92	-	2.67	[17]

Table S3. The performance of electrically Zn-air batteries in the literature.

Catalysts	Electrolyte	Peak power density (mW·cm^{-2})	Stability	Ref.
SPZ-800-14	6.0 M KOH and 0.2 M $Zn(Ac)_2$	70	90 h	This work
WC-3-0.8	6.0 M KOH and 0.2 M $ZnCl_2$	84.1	-	[3]
NHPC-0.5	6 M KOH	25.1	100 cycles	[5]
MS-NPC	Gel electrolyte	127.9	-	[18]
G800	6 M KOH	-	18	[19]
N–CNSP	6 M KOH	160	160	[20]

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