Electronic Supplementary Information

Biomass-derived nitrogen self-doped porous carbon as effective metal-free catalysts for oxygen reduction reaction

Xiaojun Liu,[a] Yucheng Zhou,[a] Weijia Zhou,*[a] Ligui Li,[a] Shaobin Huang,[a] and Shaowei Chen*[a,b]

[a] *New Energy Research Institute, School of Environment and Energy, South China University of Technology, Guangzhou Higher Education Mega Center, Guangzhou, Guangdong 510006, China*

E-mails: eszhouwj@scut.edu.cn (W.J.Z.); shaowei@ucsc.edu (S.W.C).

[b] *Department of Chemistry and Biochemistry, University of California, 1156 High Street, Santa Cruz, California 95064, United States*

Table S1. Comparison of catalytic performances of WHCs and biomass-derived carbon materials in other literature

Authors	Onset potential	n (Potentials)	High Stability	Tolerance to crossover effect
Liu et al.[9]	+ 0.97 V (V vs. RHE)	~3.97 (0.45 to -0.65 V vs. RHE)	Yes	Yes
Sung et al.[16]	+ 0.85 V (V vs. RHE)	3.8-3.9 (-0.2 to -0.8 V vs. Ag/AgCl)	Yes	Yes
Guo et al.[41]	+ 0.90 V (V vs. RHE)	~3.5 (-0.5 to-0.7 V vs. Hg/HgO)	-	-
Li et al.[42]	0.00 V (V vs. Ag/AgCl)	~3.4 (-0.6 vs Ag/AgCl)	Yes	-
Guo et al.[43]	+ 0.90 V (V vs. RHE)	~3.1(-0.5 to-0.7 V vs. Hg/HgO)	Yes	-
Wang et al.[44]	+ 0.975 V (V vs. RHE)	~3.5 (0.3 to 0.5 V vs. RHE)	-	-
Gokhale et al.[45]	+ 0.88V (V vs. RHE)	~3.5 (0.1 to 0.7 V vs RHE)	Yes	-
Lu et al.[46]	+0.84 V (V vs. RHE)	3.2-3.6 (-0.3 to -0.8 V vs. Ag/AgCl)	Yes	Yes
This work	+0.98 V	3.5-3.82 (0 to 0.85 V vs RHE)	Yes	Yes

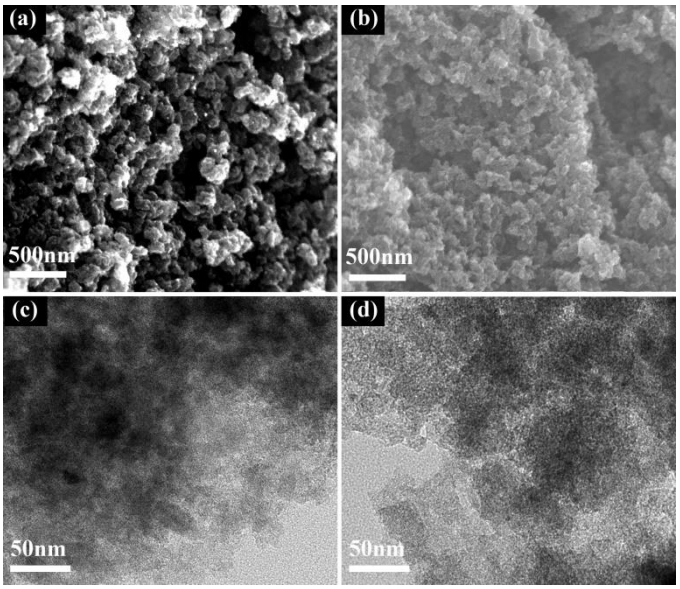

Fig. S1 (a and b) SEM and (c and d) TEM images of the WHC-600 and WHC800 samples.

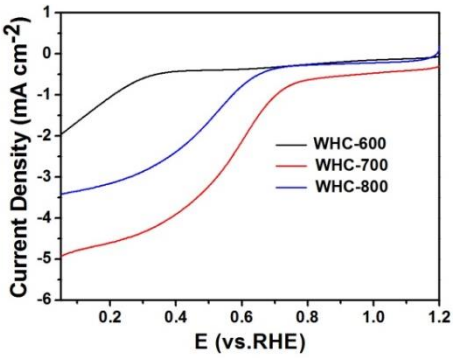

Fig. S2 RDE voltammograms for ORR of WHC-600, WHC-700 and WHC-800 at 1600 rpm and 10 mV s^{-1} in O_2-saturated 0.1 M $HClO_4$.

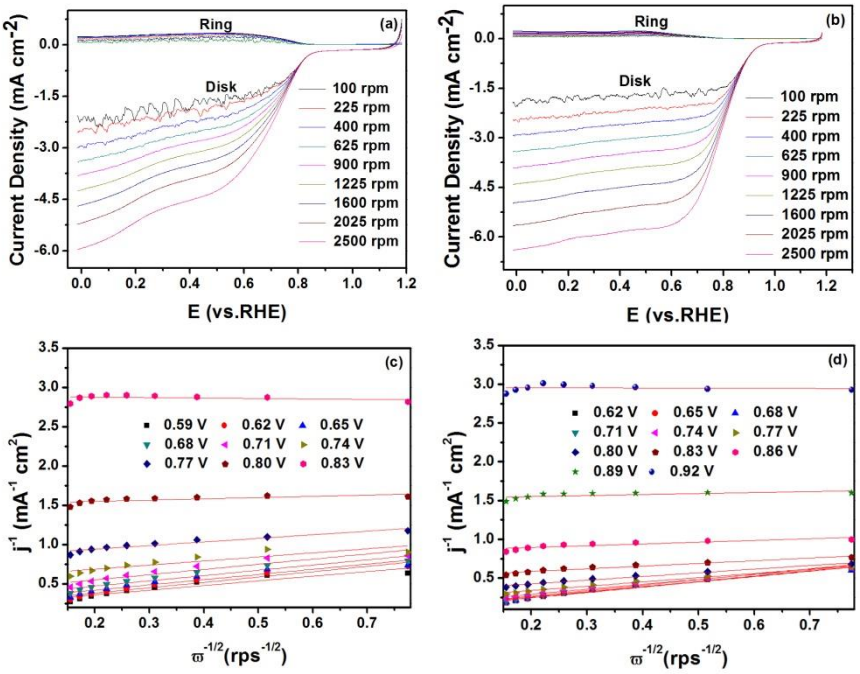

Fig. S3 (a, b) Polarization curves for ORR in O_2-saturated 0.1 M KOH solution on WHC-600 and WHC-800 electrode at various rotation rates; (c, d) Koutecky−Levich plots of WHC-600 and WHC-800 at different electrode potentials.