# Electronic Supplementary Information:

## In-situ formation of nitrogen-doped carbon nanoparticles on hollow carbon spheres as an efficient metal-free electrocatalyst towards the oxygen reduction reaction

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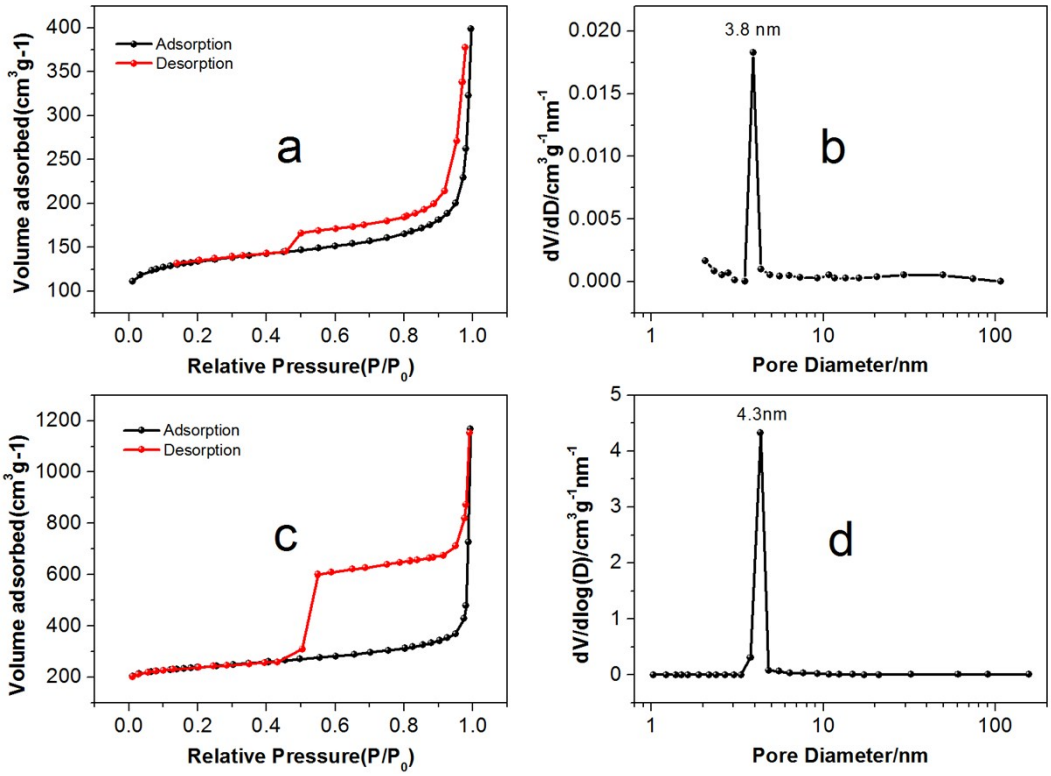


**Fig. S1** $N_2$ adsorption–desorption isotherm loop of (a) HPSs and (c) HCSs; BJH desorption pore size distribution of (b) HPSs and (d) HCSs.

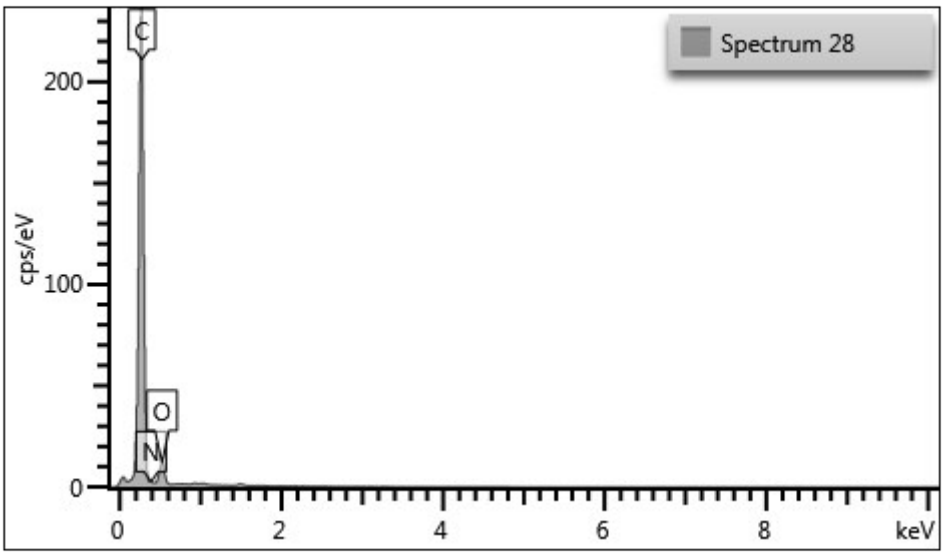


**Fig. S2** EDX spectra of NHCS-2.

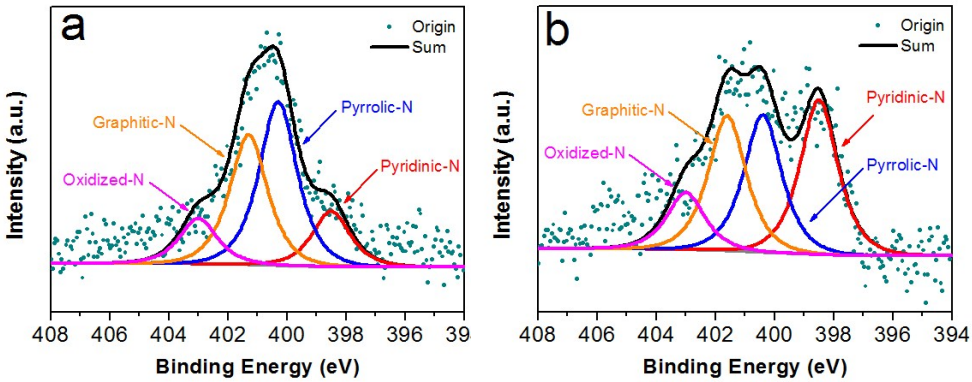


**Fig. S3** High-resolution XPS spectra of the NHCS-1 and NHCS-3.

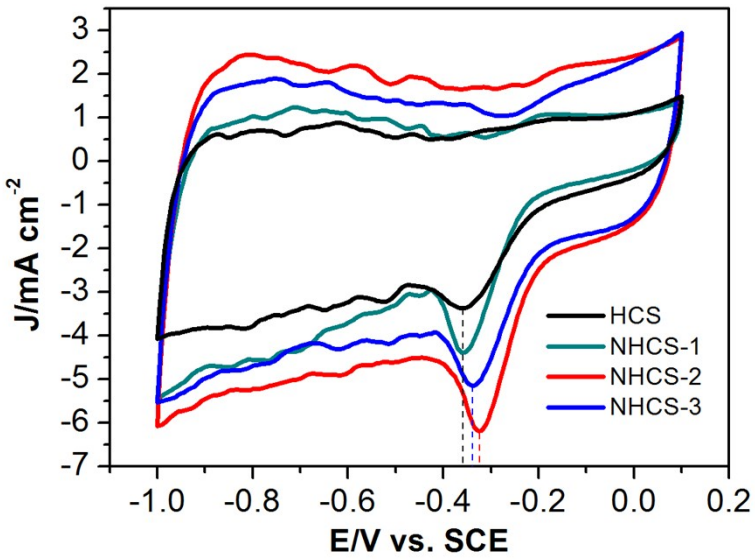


**Fig. S4** Comparison of CV curves of the HCS, NHCS-1, NHCS-2 and NHCS-3 with scanning rates of 50 mV $s^{-1}$ in $O_2$-statured 0.1 M KOH solution.

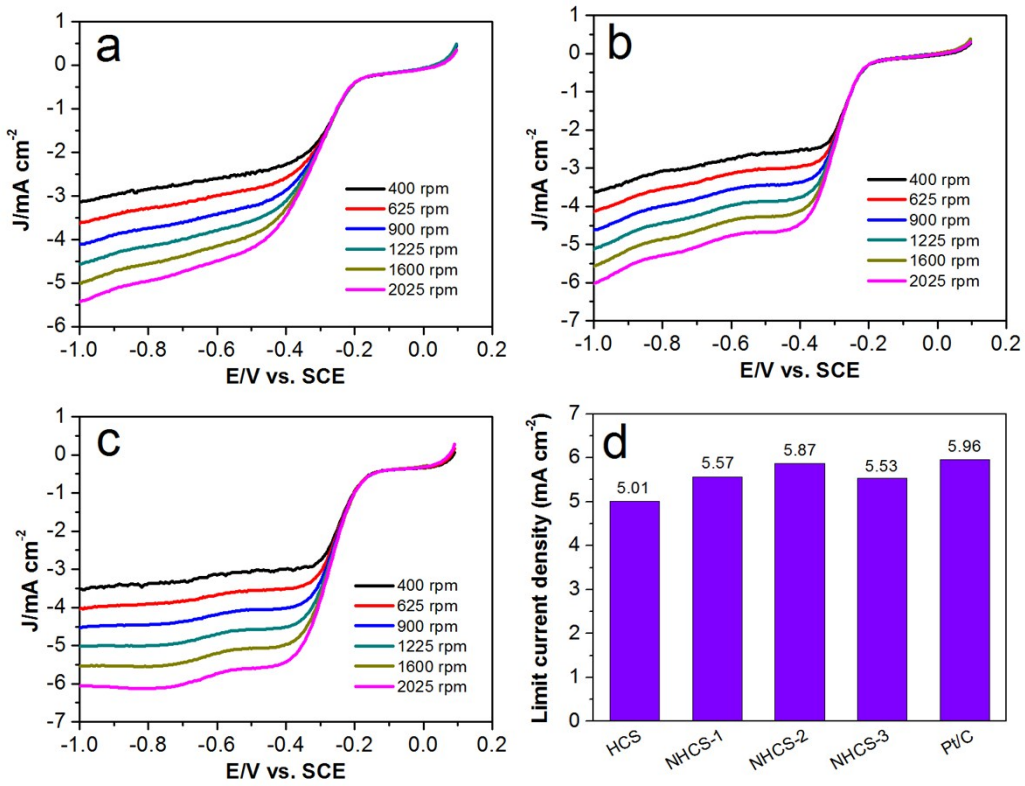


**Fig. S5** LSV curves of the (a) HCSs, (b) NHCS-1 and (c) NHCS-3 in $O_2$-saturated 0.1 M KOH solution at a different rotation rate from 400 to 2025 rpm; (d) Limit current density of the samples and commercial 20% Pt/C in $O_2$-saturated 0.1 M KOH solution at a rotation rate of 1600 rpm.