Electronic Supplementary Information

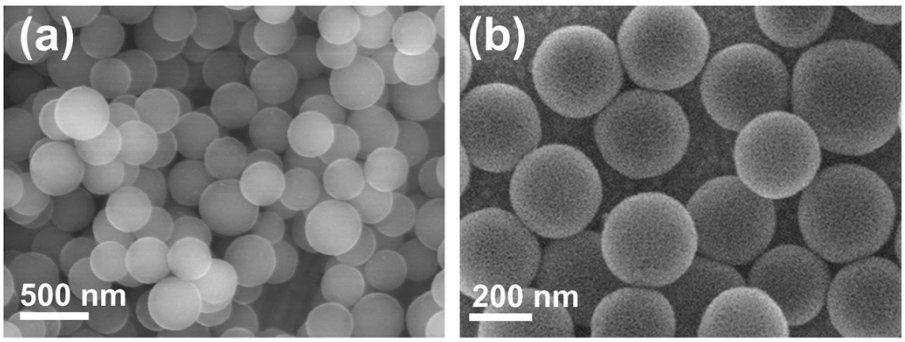

Fig. S1 SEM images of (a) SiO_2@SiO_2/RF and (b) HMCSs.

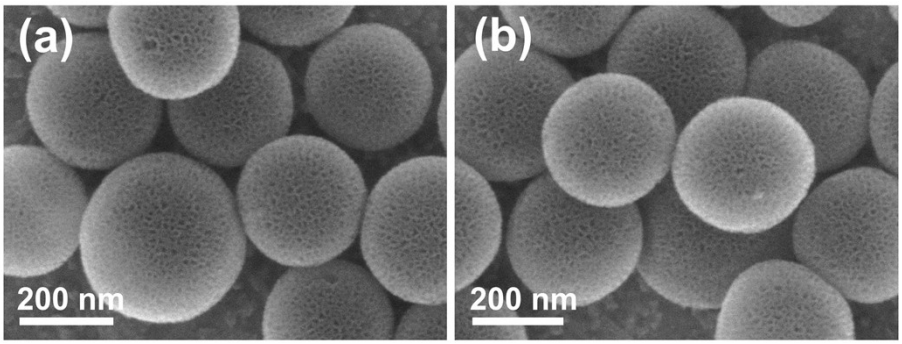

Fig. S2 SEM images of (a) HMCSs@OT and (b) HMCSs@NT.

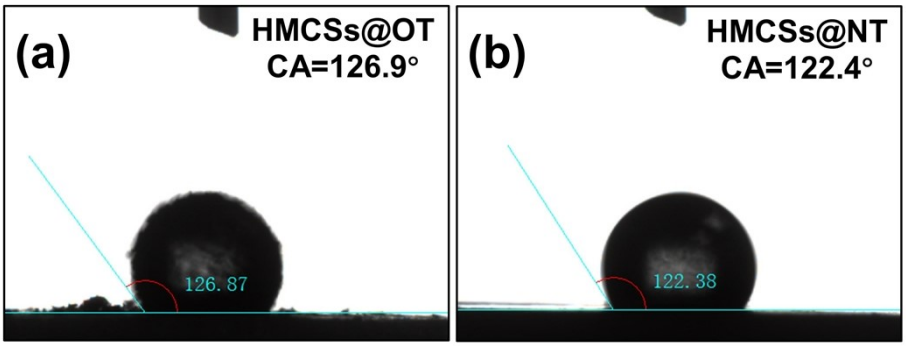

Fig. S3 Contact angles of (a) HMCSs@OT and (b) HMCSs@NT.

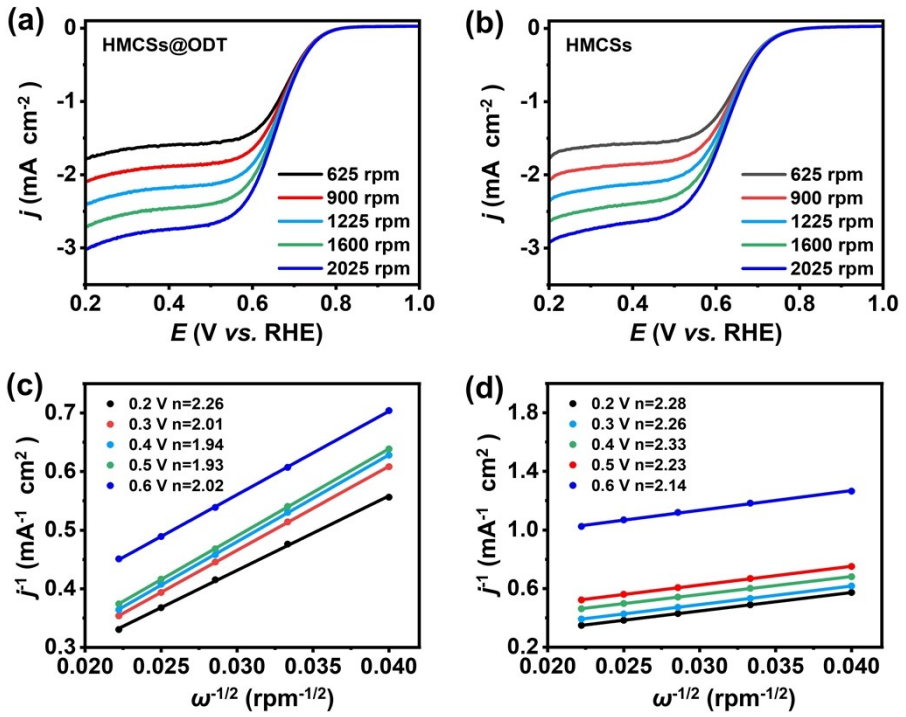

Fig. S4 ORR polarization curves of (a) HMCSs@ODT and (b)HMCSs at different RDE rotation rates. The electron transfer numbers of (c) HMCSs@ODT and (d)HMCSs at different potentials.

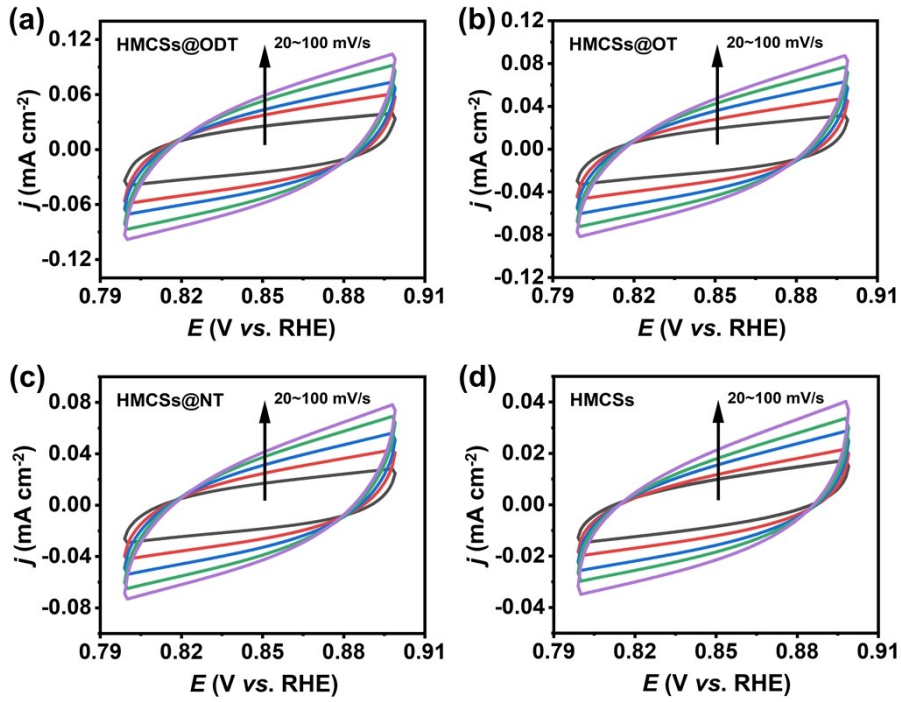

Fig. S5 (a-d) Cyclic voltammetry curves of various samples measured in the potential range of 0.8–0.9 V *vs*. RHE with scan rates ranging from 20 to 100 mV s^{-1} in the 0.1 M KOH solution.

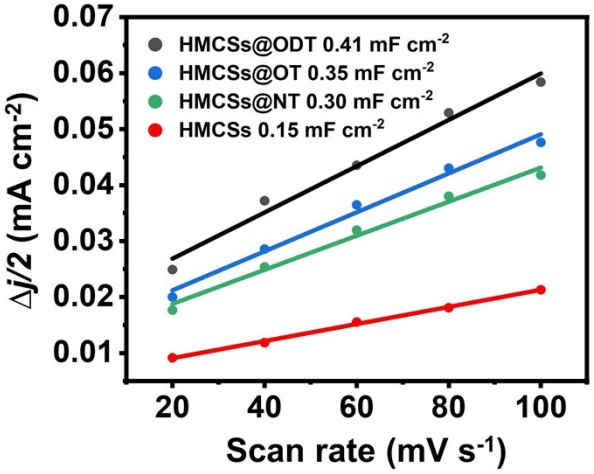

Fig. S6 The differences in current density variation (Δj) at an overpotential of 0.85 V plotted against scan rate fitted to a linear regression enabled the estimation of electrochemical double-layer capacitance (C_{dl}).

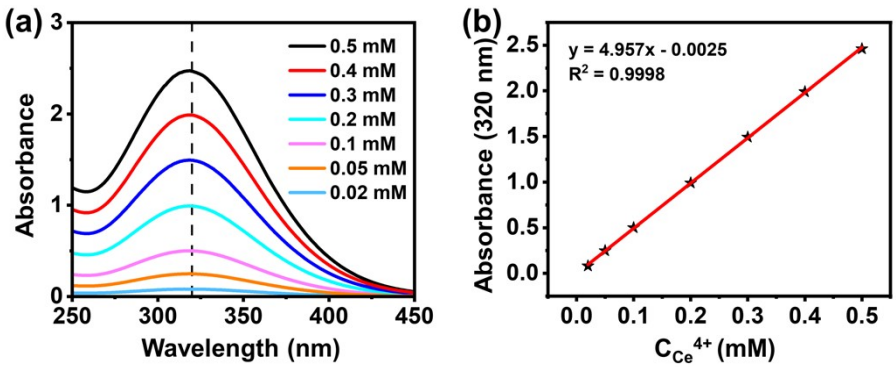

Fig. S7 (a) UV-vis absorption spectra of Ce^{4+} solution with various concentrations and (b) the corresponding standard curve.

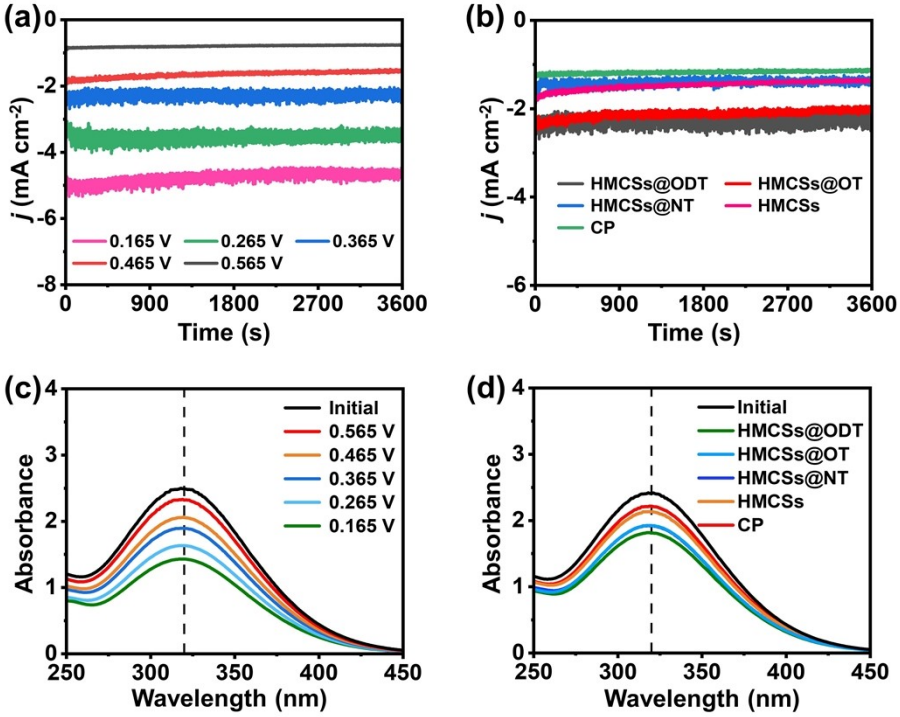

Fig. S8 (a) Chronoamperometry curves for HMCSs@ODT at various potentials in O_2-saturated 0.1 M KOH for 3600 s. (b) Chronoamperometry curves for different samples at 0.365 V_{RHE} in O_2-saturated 0.1 M KOH for 3600 s. (c) UV-vis absorption spectra of the electrolytes colored with ceric sulfate indicator at various potentials with HMCSs@ODT. (d) UV-vis absorption spectra of the electrolytes colored with ceric sulfate indicator with different samples at 0.365 V_{RHE}.

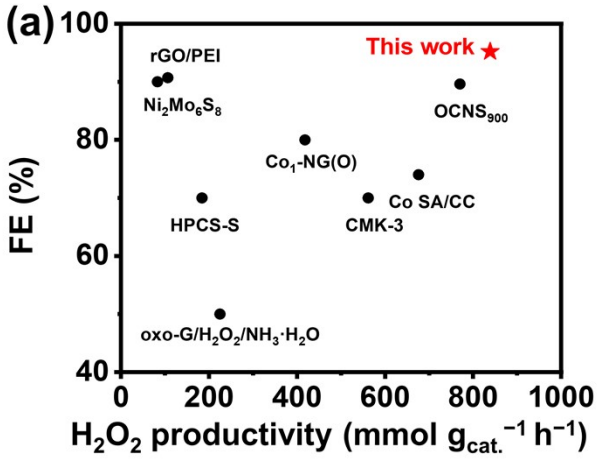

Fig. S9 H_2O_2 productivity and faradaic efficiency of HMCSs@ODT compared to the reported electrocatalysts.

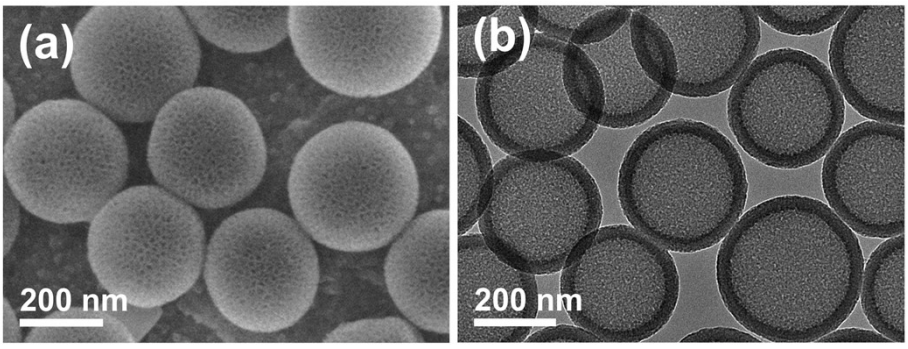

Fig. S10 (a) SEM and (b) TEM image of the HMCSs@ODT after stability test.

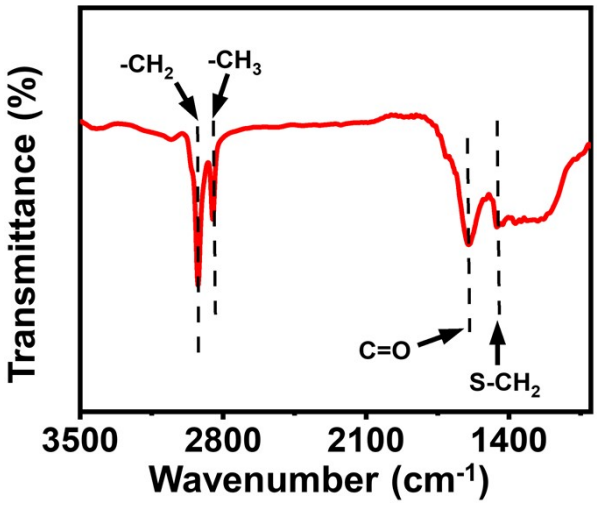

Fig. S11 FTIR spectrum of HMCSs@ODT after recycling stability test.

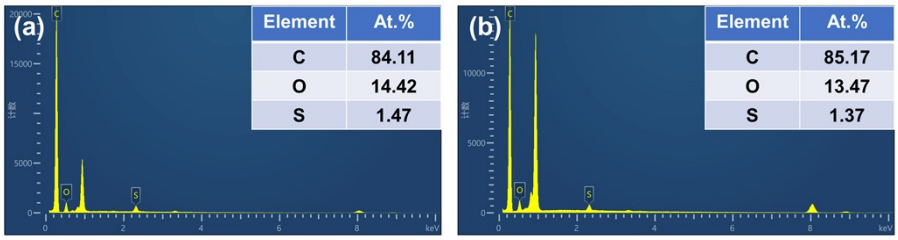

Fig. S12 EDS spectra of HMCSs@ODT (a) before and (b) after recycling stability test.

Table S1. Elemental contents of C, O, and S in HMCSs and HMCSs@ODT.

Sample	C (at%)	O (at%)	S (at%)
HMCS	88.3	11.7	—
HMCS@ODT	91.1	7.6	1.3

Table S2. The Comparison between HMCSs@ODT and other reported $2e^-$ ORR electrocatalysts for electrosynthesis of hydrogen peroxide.

Electrocatalyst	Electrolyte	FE (%)	Productivity	Ref.
HMCSs@ODT	**0.1 M KOH**	**95.2**	**838.8 mmol $g_{cat.}^{-1}$ h^{-1}**	**This work**
oxo-G/H_2O_2/$NH_3 \cdot H_2O$	0.1 M KOH	50	224.8 mmol $g_{cat.}^{-1}$ h^{-1}	1
Co_1-NG(O)	0.1 M KOH	80	418 mmol $g_{cat.}^{-1}$ h^{-1}	2
rGO/PEI	0.1 M KOH	90.7	106.4 mmol $g_{cat.}^{-1}$ h^{-1}	3
$Ni_2Mo_6S_8$	0.1 M KOH	＞90	90 mmol $g_{cat.}^{-1}$ h^{-1}	4
HPCS-S	0.1 M KOH	70	183.99 mmol $g_{cat.}^{-1}$ h^{-1}	5
CMK-3	0.1 M KOH	70	561.7 mmol $g_{cat.}^{-1}$ h^{-1}	6
$OCNS_{900}$	0.1 M KOH	89.6	770 mmol $g_{cat.}^{-1}$ h^{-1}	7
Co SA/CC	0.5 M H_2SO_4	74	676 mmol $g_{cat.}^{-1}$ h^{-1}	8

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