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

Supporting Information

The Regulation of Electrochemical Oxygen Reduction Performance by Surface Oxygen Vacancies on Hematite Nanosheets

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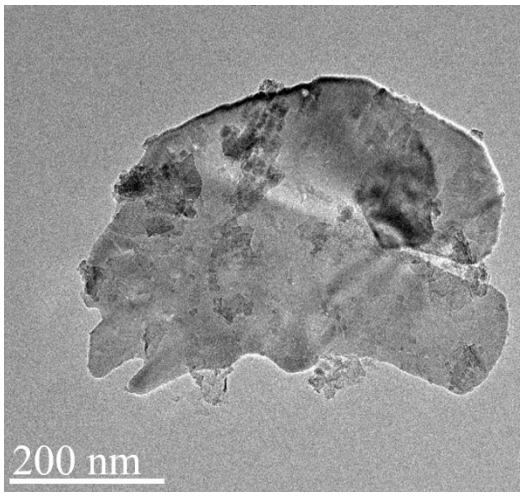

Fig. S1 TEM image of α-Fe_2O_3-1M.

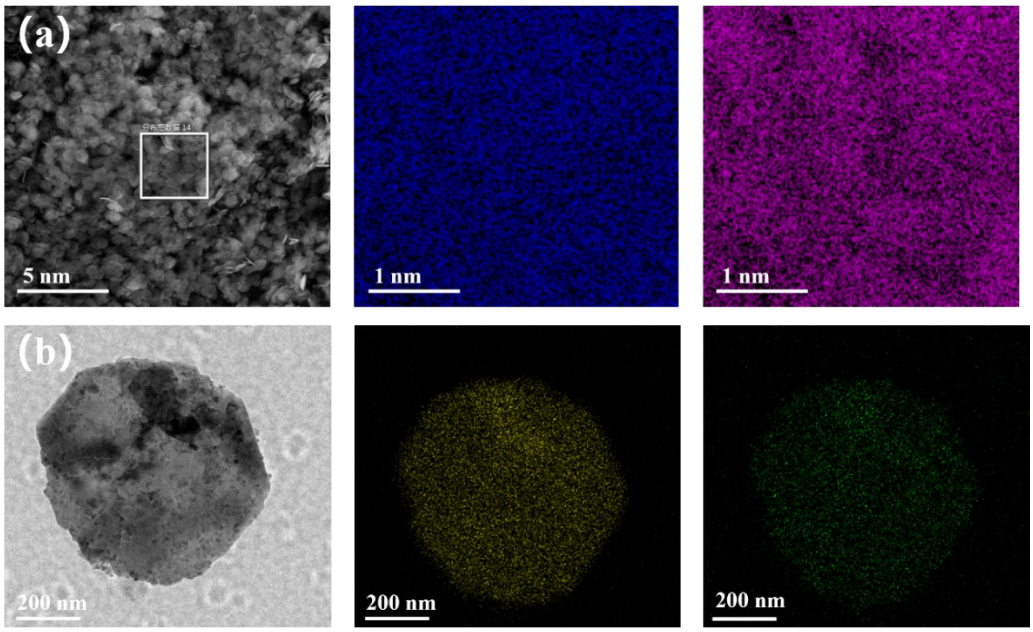

Fig. S2 α-Fe_2O_3-1M mapping of SEM(a) and TEM(b)

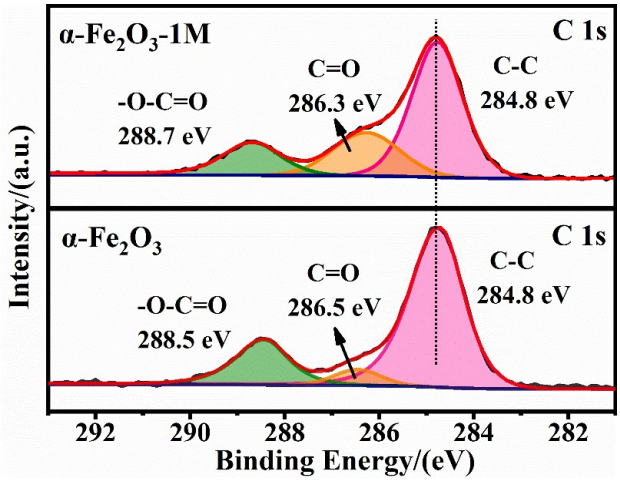

Fig. S3 High-resolution XPS spectra of C 1s core levels for the as-prepared α-Fe_2O_3 and α-Fe_2O_3-1 samples.

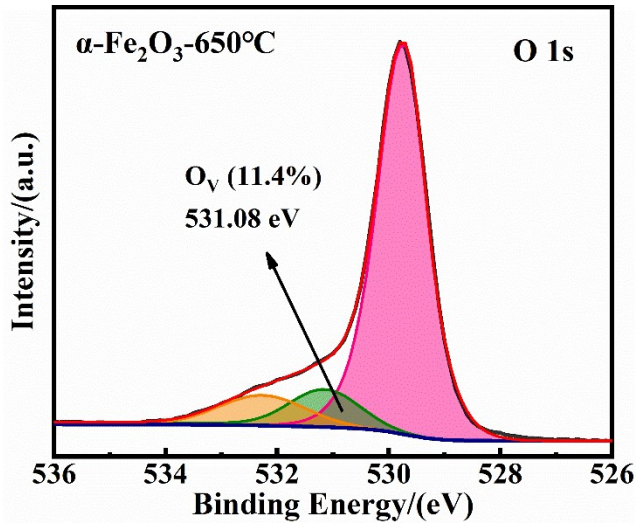

Fig. S4 O1s high-resolution XPS spectra of α-Fe_2O_3-650℃.

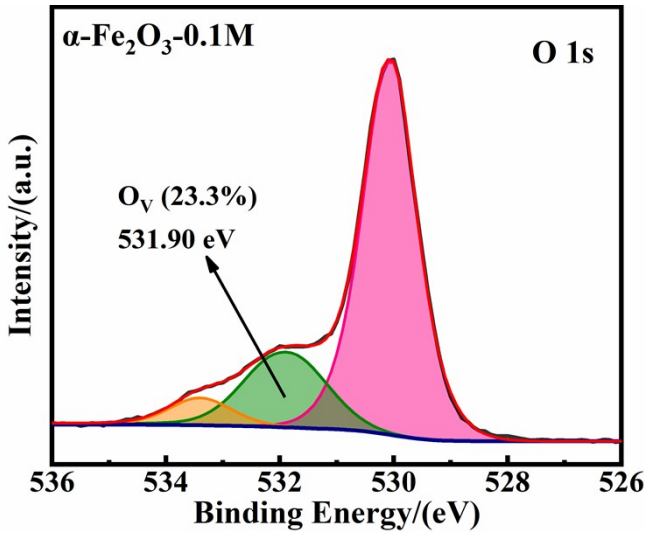

Fig. S5 O1s high-resolution XPS spectra of α-Fe_2O_3-0.1M.

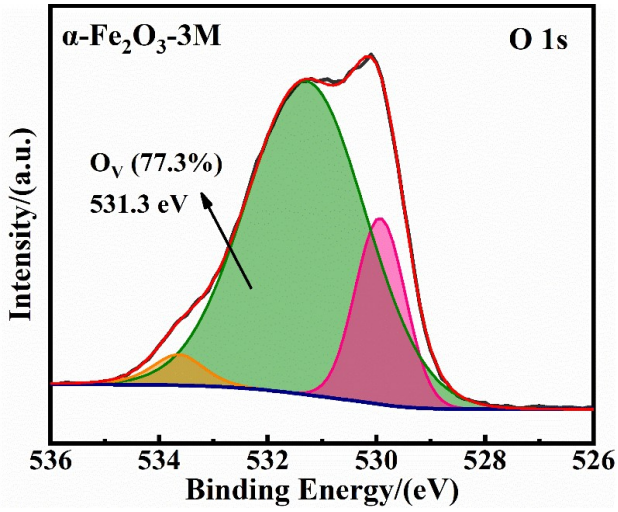

Figure S5

Fig. S6 O1s high-resolution XPS spectra of α-Fe_2O_3-3M.

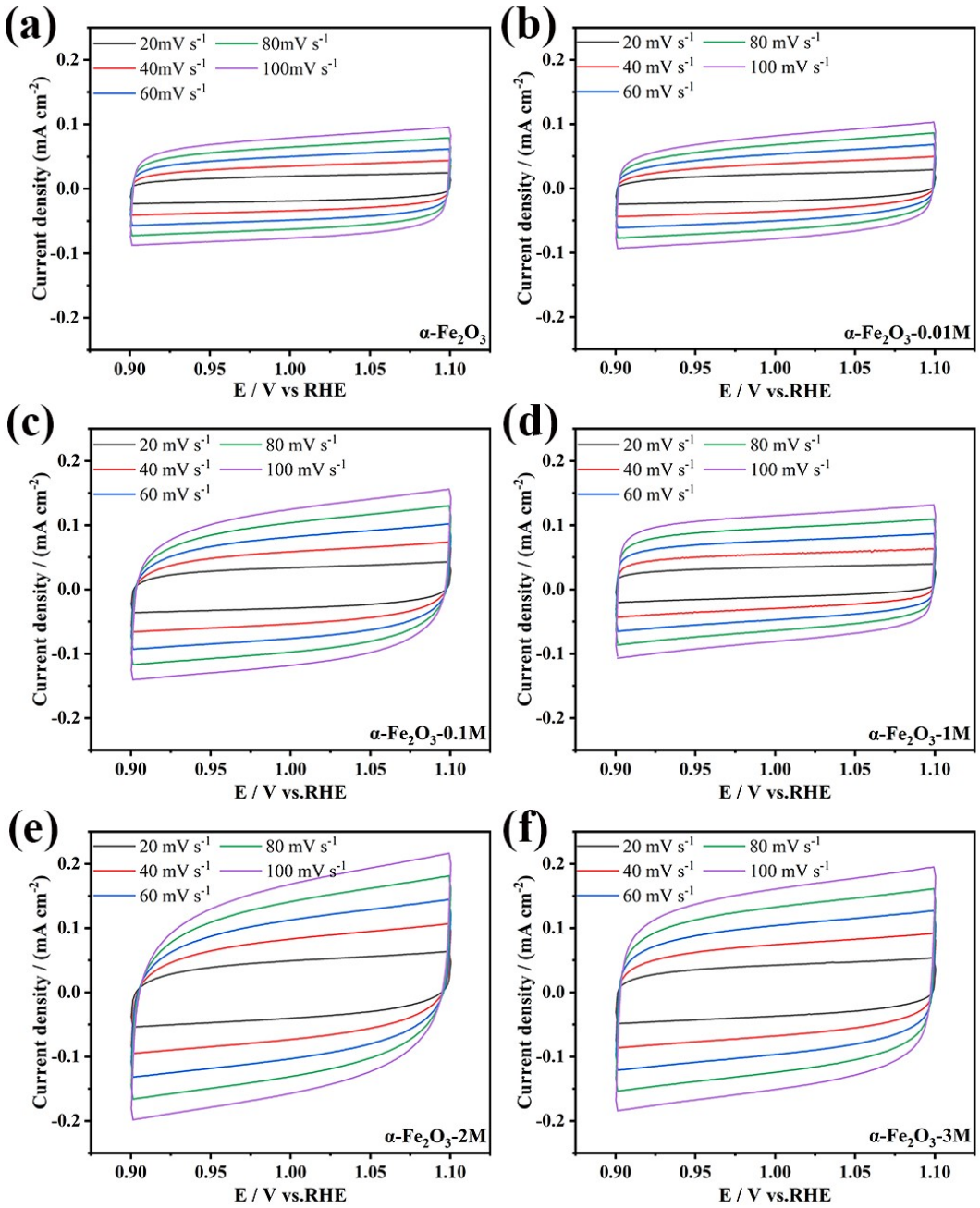

Fig. S7 CV curves of (a) α-Fe_2O_3 nanosheets, (b) α-Fe_2O_3-0.01M, (c) α-Fe_2O_3-0.1M, (d) α-Fe_2O_3-1M ,(e) α-Fe_2O_3-2M and(f) α-Fe_2O_3-3M at different scan rates.

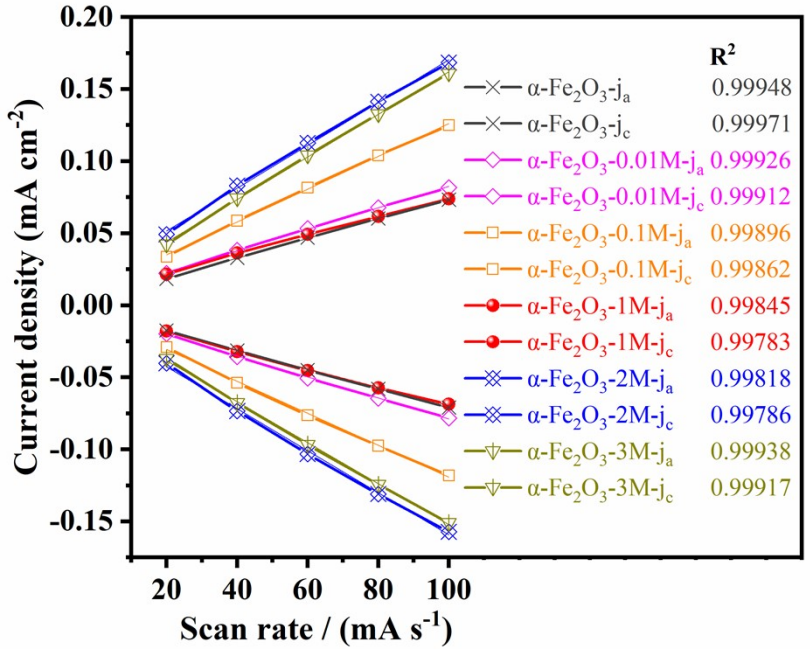

Fig. S8 Anodic and cathodic current densities (denoted as j_a and j_c, respectively) as a function of scan rate for iron oxide samples at a potential of 1.0 V vs.RHE.

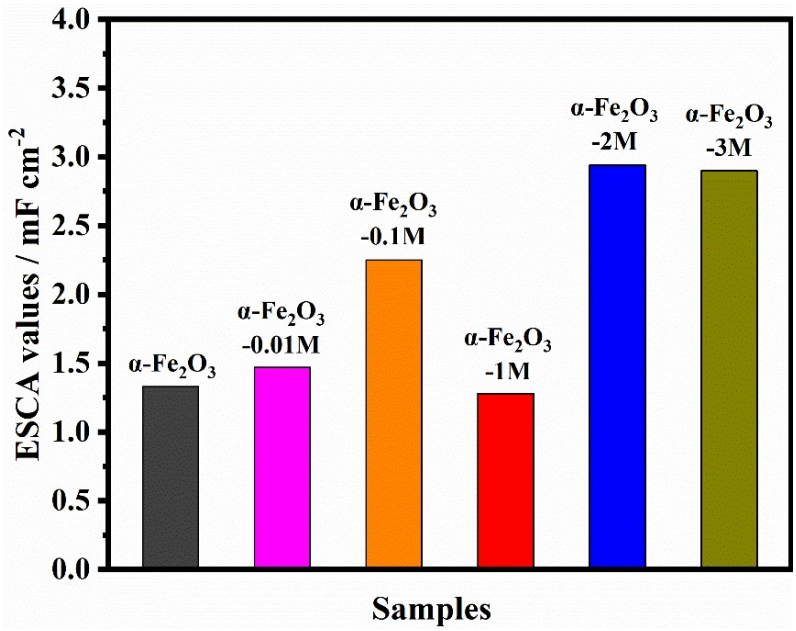

Fig. S9 The ECSA value of electrocatalysts was judged by twice the double-layer capacitance.

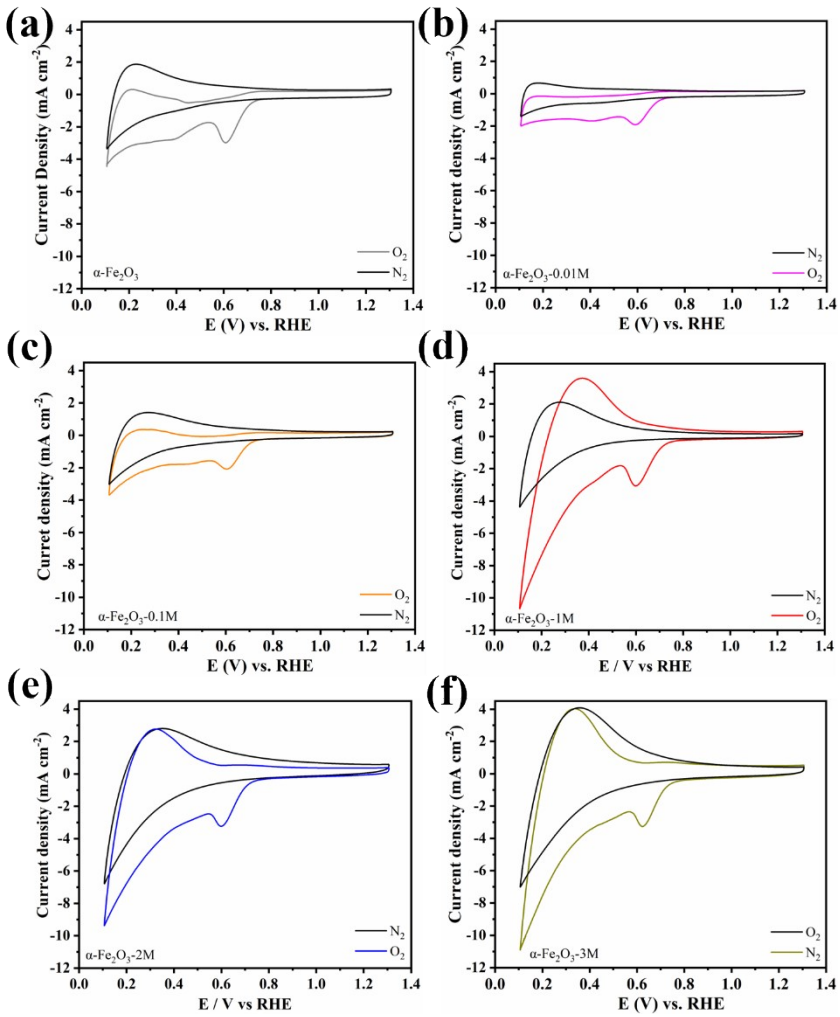

Fig. S10 CV curves of (a) α-Fe_2O_3 nanosheets, (b) α-Fe_2O_3-0.01M, (c) α-Fe_2O_3-0.1M, (d) α-Fe_2O_3-1M ,(e) α-Fe_2O_3-2M and(f) α-Fe_2O_3-3M under different atmospheres.

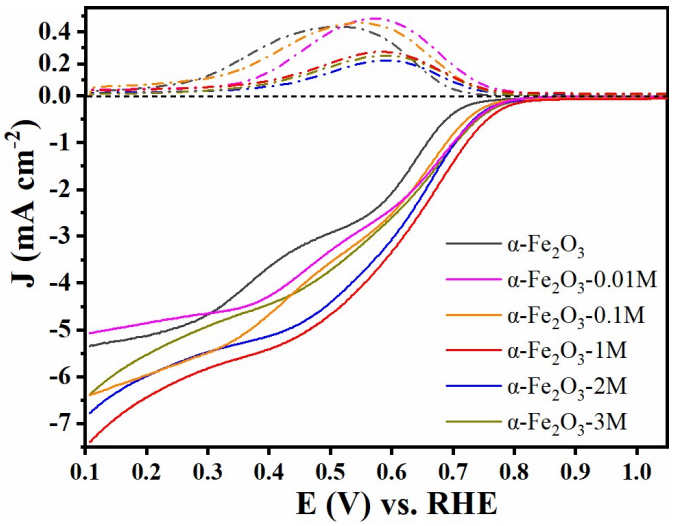

Fig. S11 LSV curves of RRDE at 1600 r.p.m. in 0.1 M KOH solution.

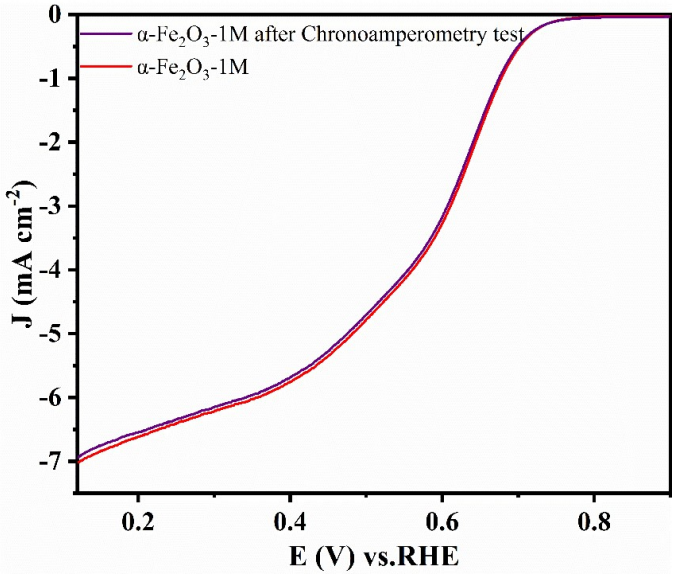

Fig. S12 Comparison of LSV curves of α-Fe_2O_3-1M catalysts before and after testing by Chronoamperometry

Table S1 The simulated element values of the fitted equivalent circuit of the EIS spectrum.

	α-Fe_2O_3	α-Fe_2O_3-1M	α-Fe_2O_3-2M
*R*s/Ω	49.14	54.41	40
*R*ct/Ω	1760	611.3	2459

Table S2 Activity comparison of iron oxide materials for electrocatalytic oxygen reduction process in 0.1 M KOH electrolyte

Catalysts	Current density at 0.4V vs. RHE (mA cm^{-2})	ref
α-Fe_2O_3-O_V	5.75	this work
OMCs-Fe_2O_3	4.35	(S1)
{012}-Fe_2O_{3-x}	3.20	(S2)
α-Fe_2O_3/N-CNTs	3.82	(S3)
α-Fe_2O_3/Fe_3O_4	4.90	(S4)

References

S1. He J, Li B, Mao J, Liang Y, Yang X, Cui Z, et al. Four-electron oxygen reduction from mesoporous carbon modified with Fe2O3 nanocrystals. Journal of Materials Science. 2017;52(18):10938-47.

S2. Gao RJ, Pan L, Li ZW, Shi CX, Yao YD, Zhang XW, et al. Engineering Facets and Oxygen Vacancies over Hematite Single Crystal for Intensified Electrocatalytic H_2O_2 Production. Advanced Functional Materials. 2020;30(24):1910539.

S3. Sun M, Zhang G, Liu H, Liu Y, Li J. α- and γ-Fe2O3 nanoparticle/nitrogen doped carbon nanotube catalysts for high-performance oxygen reduction reaction. Science China Materials. 2015;58(9):683-92.

S4. Wan H, Lv M, Liu X, Chen G, Zhang N, Cao Y, et al. Activating Hematite Nanoplates via Partial Reduction for Electrocatalytic Oxygen Reduction Reaction. ACS Sustainable Chemistry & Engineering. 2019;7(13):11841-9.