

Supporting information

Synthesis and characterization of $\text{IrO}_2\text{-Fe}_2\text{O}_3$ electrocatalyst for the hydrogen evolution reaction in acidic water electrolysis

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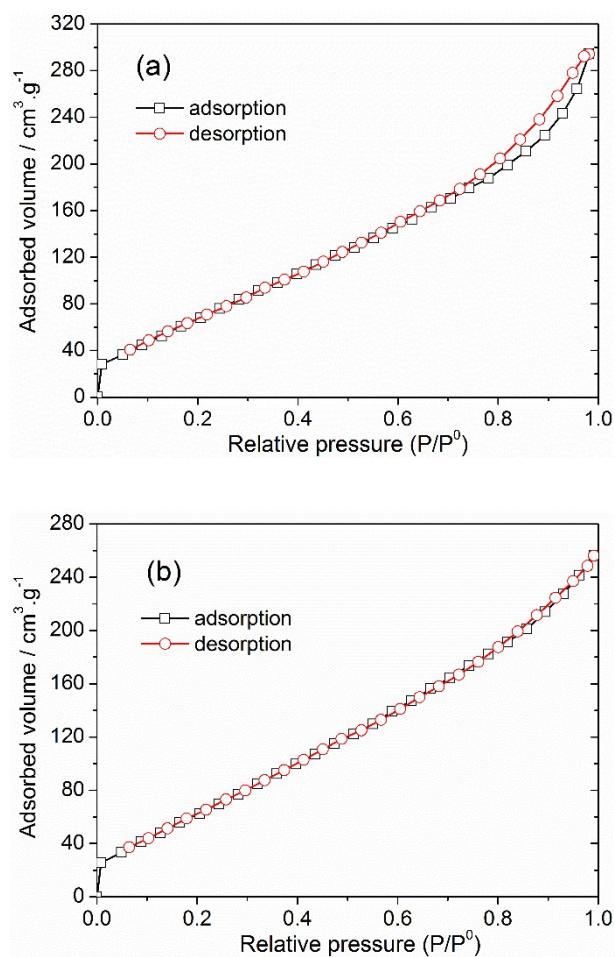


Fig. S1† The N₂ adsorption/desorption isotherms of IrO₂-Fe₂O₃ composite oxide (a) and IrO₂ (b).

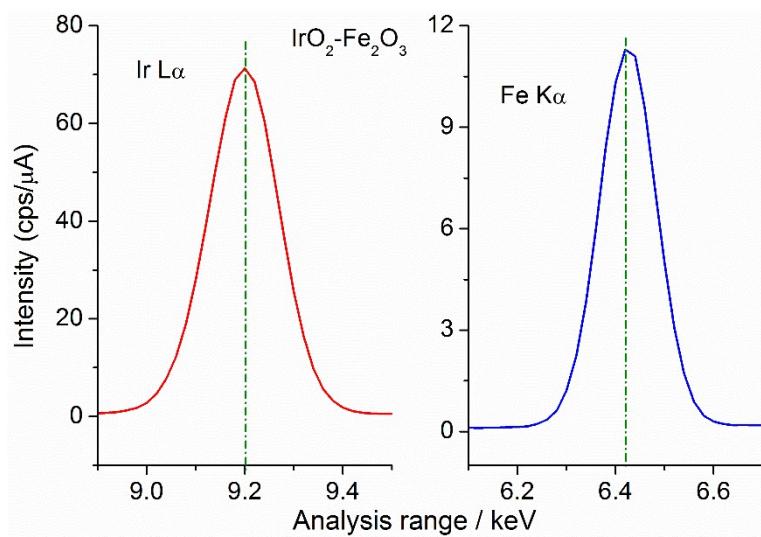


Fig. S2† The X-ray fluorescence spectrometry of Ir and Fe in IrO₂-Fe₂O₃ composite oxide

Table S1† The composition analysis of $\text{IrO}_2\text{-Fe}_2\text{O}_3$ composite oxide by X-ray fluorescence

Analyte	Atom%	Anal.(keV)	Line
IrO ₂ -Fe ₂ O ₃ before 600 cycles of CV measurement			
Ir	88.39	8.9 - 9.4	IrLa
Fe	11.61	6.2 - 6.6	FeKa
IrO ₂ -Fe ₂ O ₃ after 600 cycles of CV measurement			
Ir	89.62	8.9 - 9.4	IrLa
Fe	10.38	6.2 - 6.6	FeKa

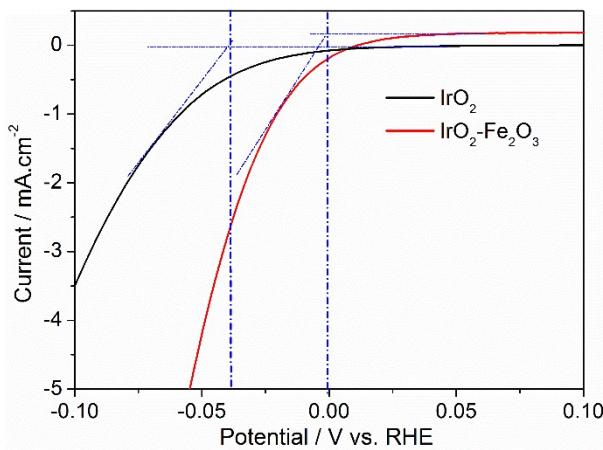


Fig. S3† The onset potential of Linear sweep voltammetry curves of $\text{IrO}_2\text{-Fe}_2\text{O}_3$ (red line) and IrO_2 (black line) electrodes in $0.5 \text{ mol}\cdot\text{L}^{-1} \text{H}_2\text{SO}_4$ solution at a sweeping rate of $5 \text{ mV}\cdot\text{s}^{-1}$.

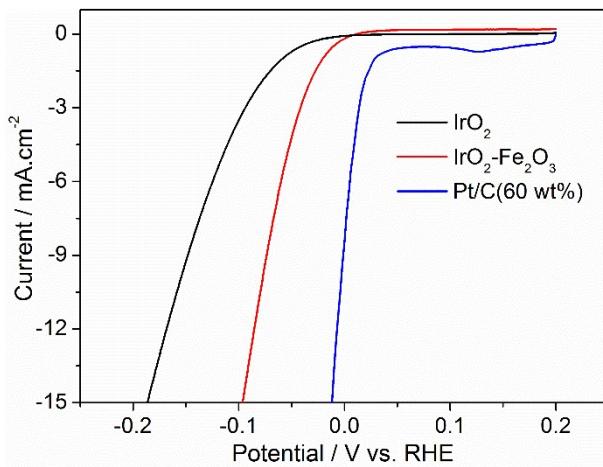


Fig. S4† Linear sweep voltammetry curves of $\text{IrO}_2\text{-Fe}_2\text{O}_3$ (red line), IrO_2 (black line) and Pt/C (blue line, 60wt%, Johnson Matthey) electrodes in $0.5 \text{ mol}\cdot\text{L}^{-1} \text{H}_2\text{SO}_4$ solution at a sweeping rate of $5 \text{ mV}\cdot\text{s}^{-1}$ in geometric surface area (GSA).

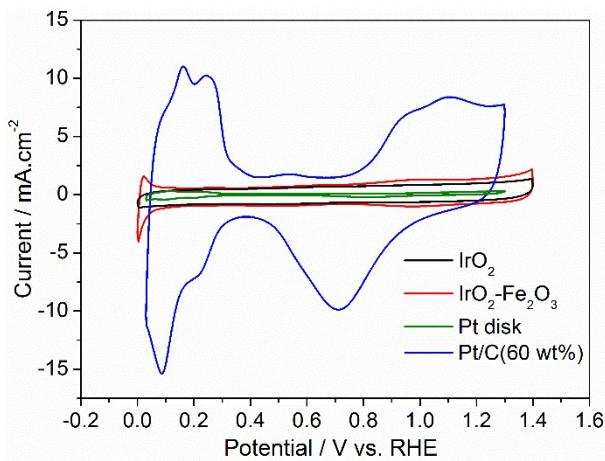


Fig. S5† Cyclic voltammograms in 0.5 mol·L⁻¹ H₂SO₄ solution at a sweeping rate of 100 mV·s⁻¹ for IrO₂-Fe₂O₃ (red line), IrO₂ (black line), Pt disk (green line) and Pt/C (60wt%, Johnson Matthey) electrodes in geometric surface area (GSA).

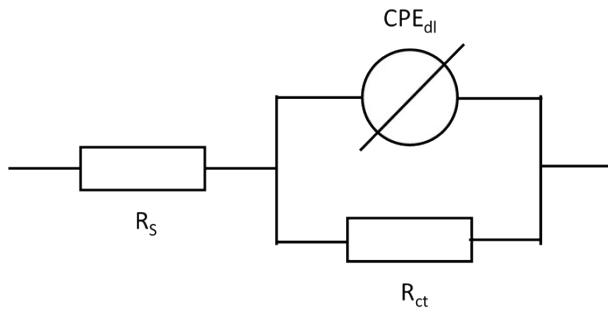


Fig. S6† The equivalent circuit of the impedance of IrO₂-Fe₂O₃ and IrO₂ electrodes

Table S2† Impedance parameters of IrO₂-Fe₂O₃ and IrO₂ electrodes obtained by fitting the experimental data to $R_s(R_{ct}C_{dl})$ equivalent circuit

Electrocatalyst	R_s / $\Omega \cdot \text{cm}^2$	R_{ct} / $\Omega \cdot \text{cm}^2$	C_{dl} / $\text{mF} \cdot \text{cm}^{-2}$	n_{dl}
IrO ₂	11.57	693.2	1.38	0.8623
IrO ₂ -Fe ₂ O ₃	9.724	232.7	3.05	0.9385

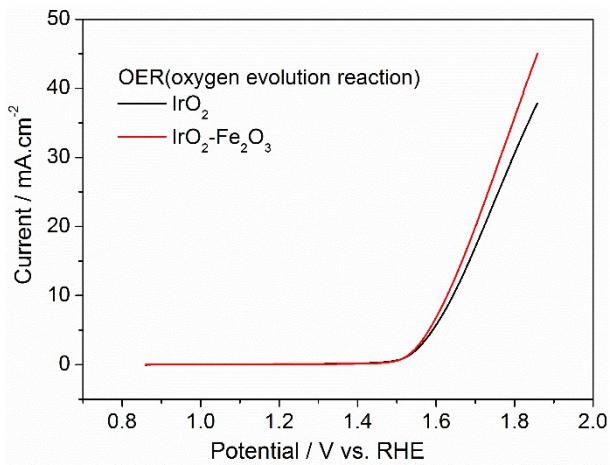


Fig. S7† Linear sweep voltammetry curves of $\text{IrO}_2\text{-Fe}_2\text{O}_3$ (red line) and IrO_2 (black line) electrodes in $0.5 \text{ mol}\cdot\text{L}^{-1} \text{ H}_2\text{SO}_4$ solution at a sweeping rate of $5 \text{ mV}\cdot\text{s}^{-1}$ in geometric surface area (GSA).