Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Colloidal synthesis of monodisperse trimetallic IrNiFe nanoparticles as highly active bifunctional electrocatalysts for acidic overall water splitting

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Supplementary Figures: Figure S1- S4

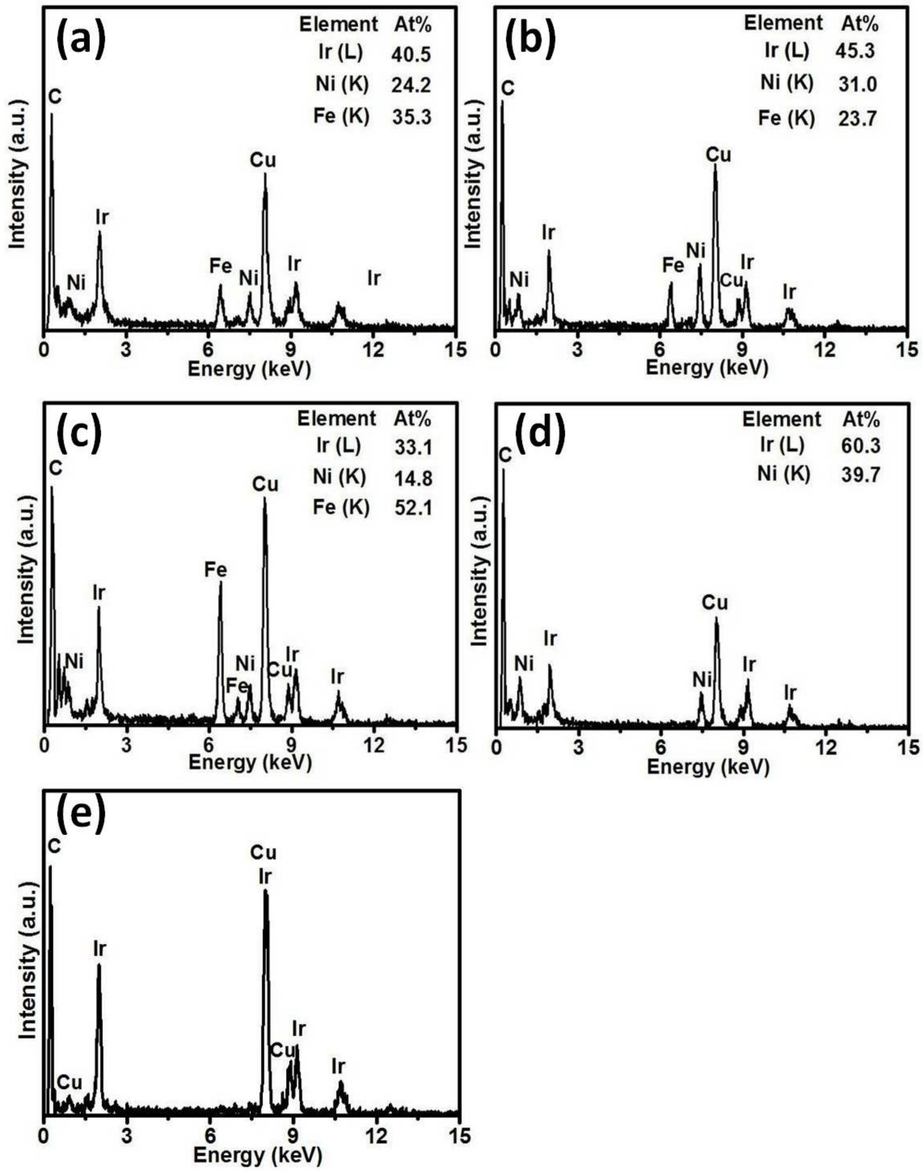

Fig. S1 EDX spectrum of $IrNi_{0.57}Fe_{0.82}$ (a), $IrNi_{0.70}Fe_{0.52}$ (b), $IrNi_{0.46}Fe_{1.59}$ (c), $IrNi_{0.68}$ (d), and Ir (e).

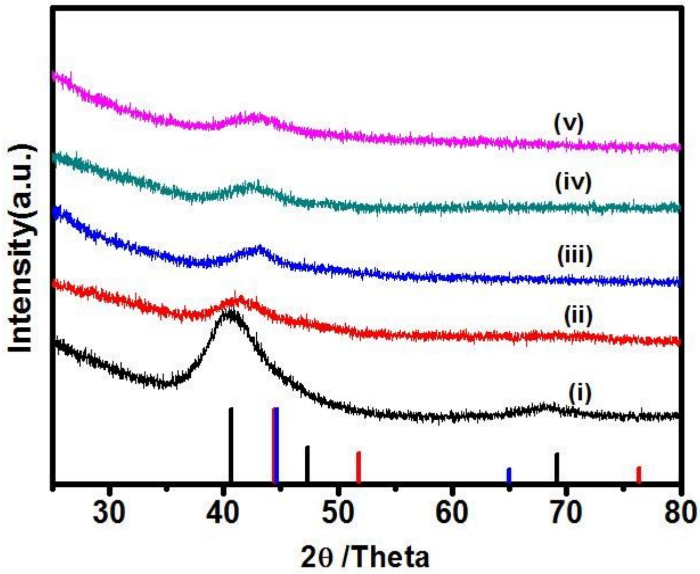

Fig. S2 XRD patterns for the as-prepared nanoparticles: (i) Ir, (ii) $IrNi_{0.68}$, (iii) $IrNi_{0.70}Fe_{0.52}$, (iv) $IrNi_{0.57}Fe_{0.82}$, (v) $IrNi_{0.46}Fe_{1.59}$. The bottoms are the corresponding standard values for Ir (black, PDF#06-0598), Ni (red, PDF#04-0850), and Fe (blue, PDF#06-0696), respectively.

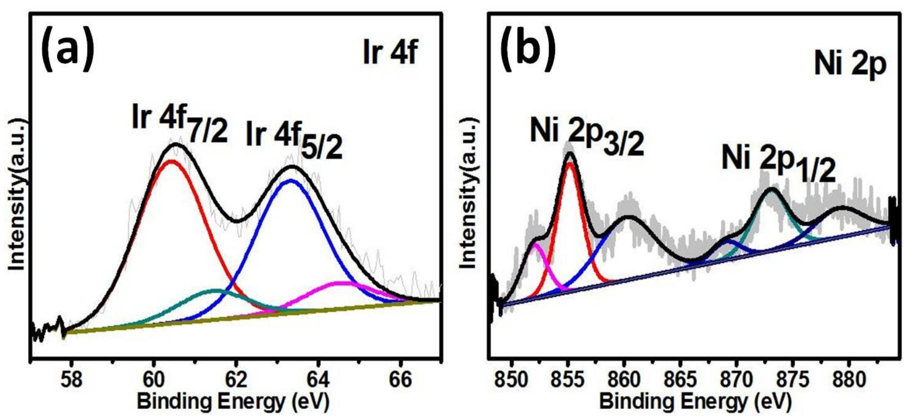

Fig. S3 The XPS spectra of (a) Ir 4f and (b) Ni 2p for $IrNi_{0.68}$.

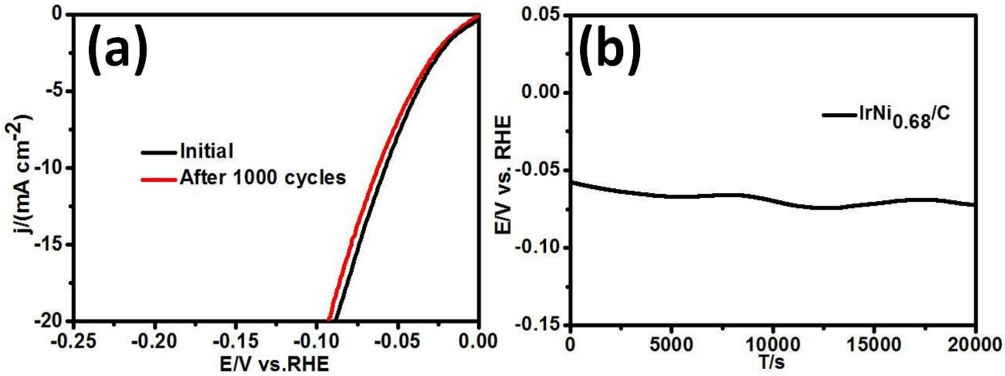

Fig. S4 (a) LSV curves of HER for $IrNi_{0.68}/C$ before and after 1000 cycles in 0.5 M $HClO_4$ solution; (b) Chronopotentiometry test of HER for $IrNi_{0.68}/C$ at 10 mA cm^{-2} in 0.5 M $HClO_4$ solution.

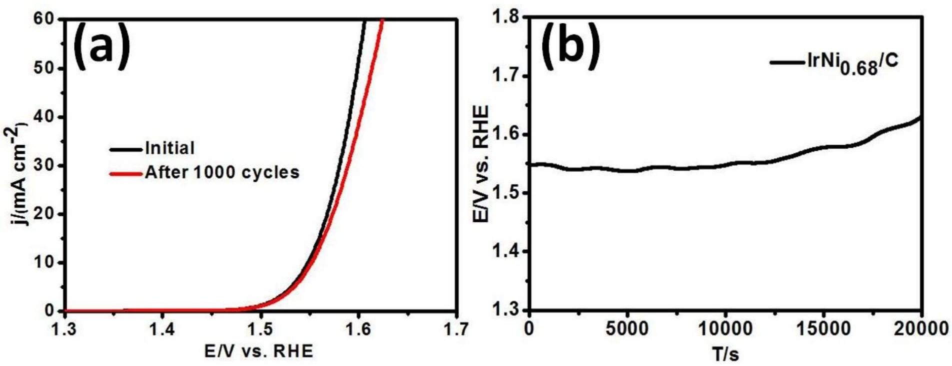

Fig. S5 (a) LSV curves of OER for $IrNi_{0.68}/C$ before and after 1000 cycles in 0.5 M $HClO_4$ solution; (b) Chronopotentiometry test of OER for $IrNi_{0.68}/C$ at 10 mA cm^{-2} in 0.5 M $HClO_4$ solution.

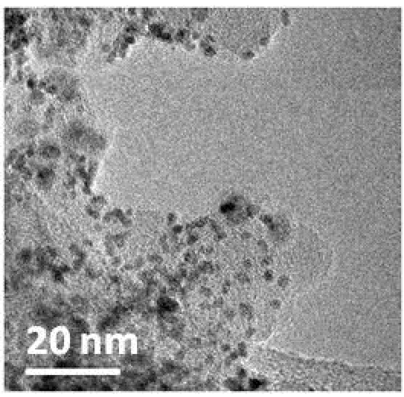

Fig. S6 TEM image of $IrNi_{0.57}Fe_{0.82}/C$ after the stability test.

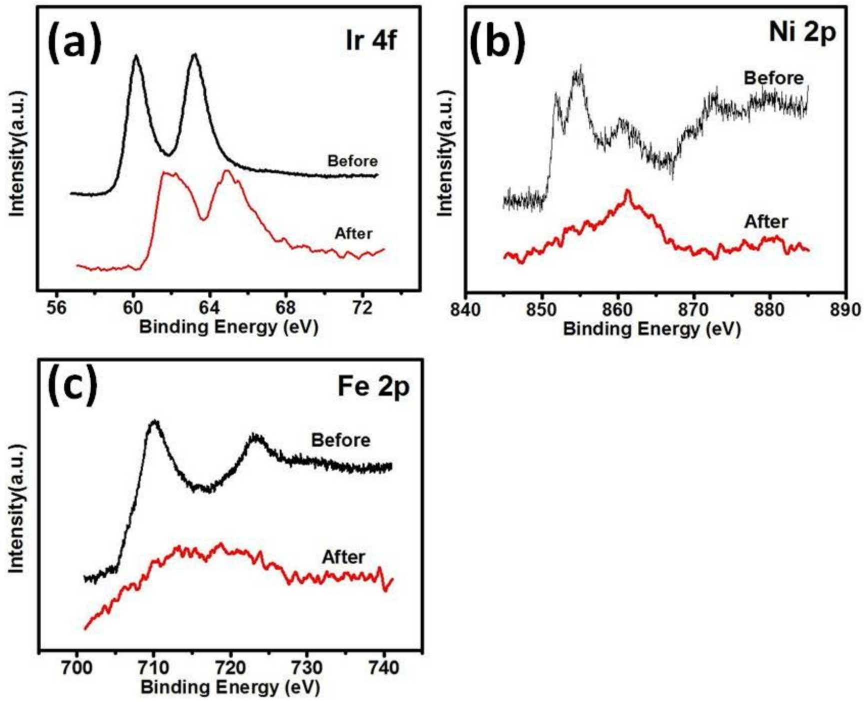

Fig. S7 The XPS spectra of (a) Ir 4f, (b) Ni 2p, and (c) Fe 2p for $IrNi_{0.57}Fe_{0.82}$ before and after OER.

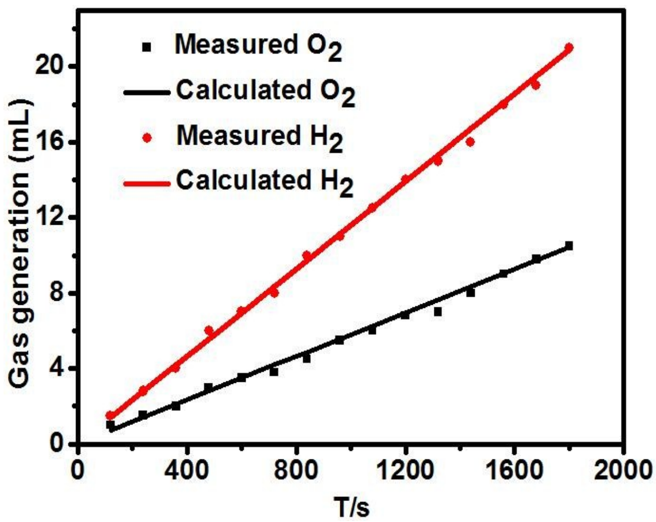

Fig. S8 Faraday efficiency of H_2 and O_2 production.

Table S1. Comparison of HER activity for different electrocatalysts in acidic electrolytes.

Catalysts	Electrolyte	Current density	η /mV	Reference
IrNiFe NPs	**0.5 M $HClO_4$**	**10 mA cm^{-2}**	**24**	**This work**
IrNiN NPs	0.1 M $HClO_4$	6 mA cm^{-2}	110	1
IrO_2–Fe_2O_3	0.5 M H_2SO_4	10 mA cm^{-2}	78	2
IrO_2–TiO_2	0.5 M H_2SO_4	10 mA cm^{-2}	112	3
Ru@C_2N	0.5 M H_2SO_4	20 mA cm^{-2}	35	4
Ru/C_3N_4/C	0.5 M H_2SO_4	10 mA cm^{-2}	70	5
Rh/Si	0.5 M H_2SO_4	50 mA cm^{-2}	110	6
Rh-MoS_2	0.5 M H_2SO_4	10 mA cm^{-2}	47	7
Pt_3Ni_3 NWs	0.5 M H_2SO_4	10 mA cm^{-2}	30	8

References

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