

Electronic Supporting Information

A trimetallic oxide V-Co-Fe nanoparticle catalyst with an excellent performance in both catalytic activity and stability for the oxygen evolution reaction

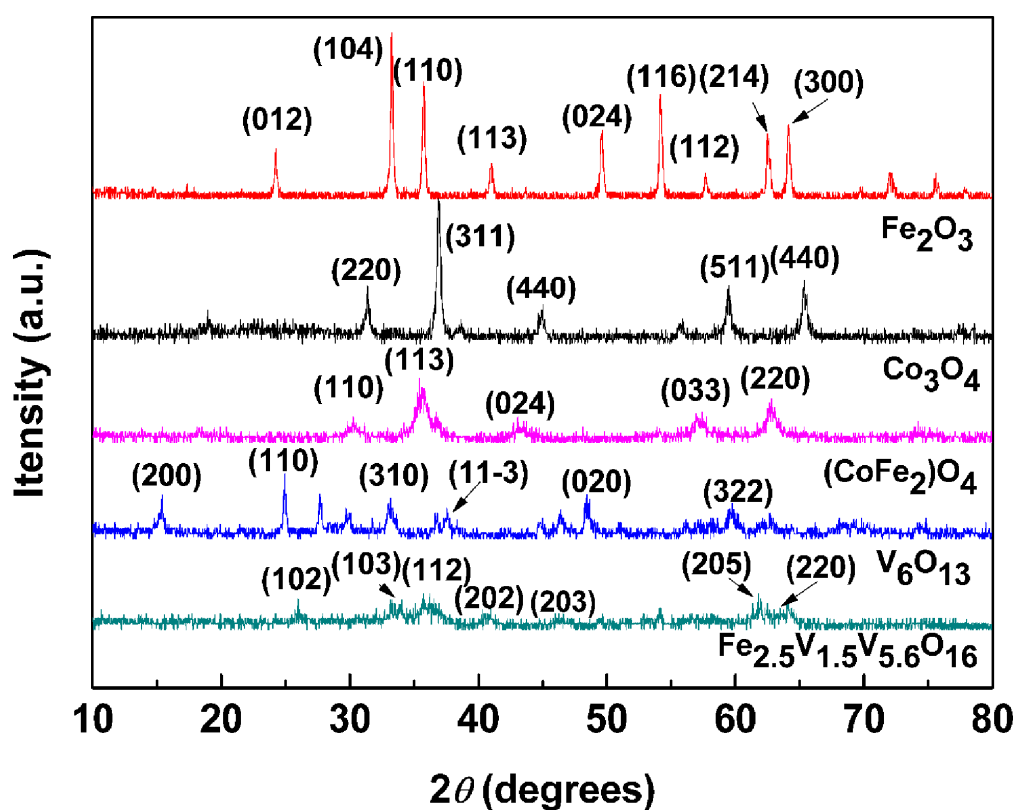


Fig S1. XRD patterns of Fe_2O_3 , Co_3O_4 , V_6O_{13} , $(\text{CoFe}_2)\text{O}_4$ and $\text{Fe}_{2.5}\text{V}_{1.5}\text{V}_{5.6}\text{O}_{16}$.

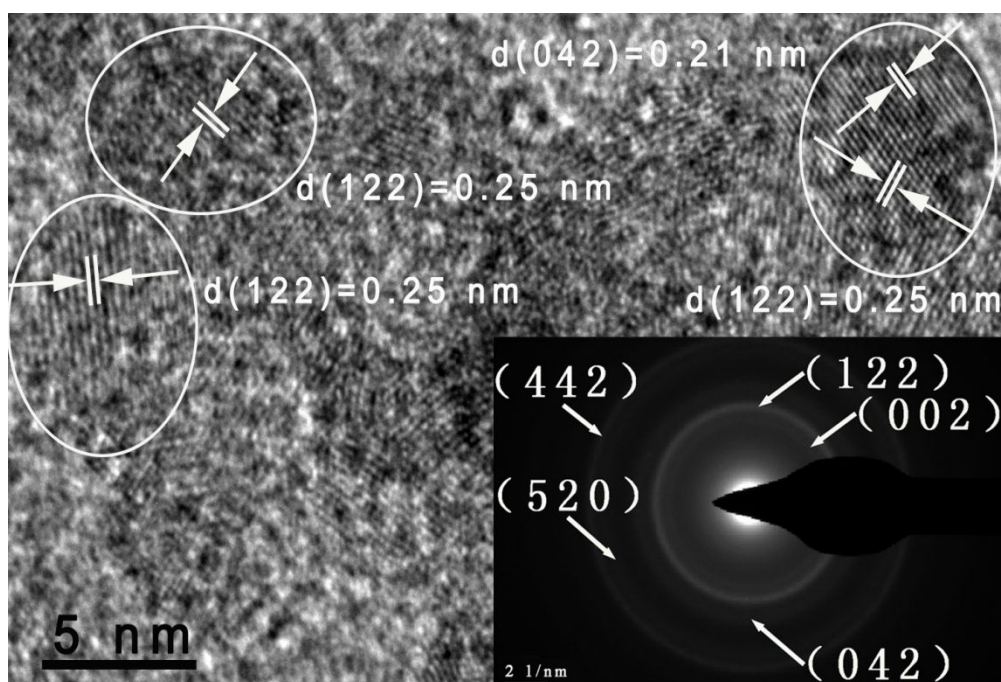


Fig S2. HRTEM image and SAED pattern (inset) of the V-Co-Fe-343 sample.

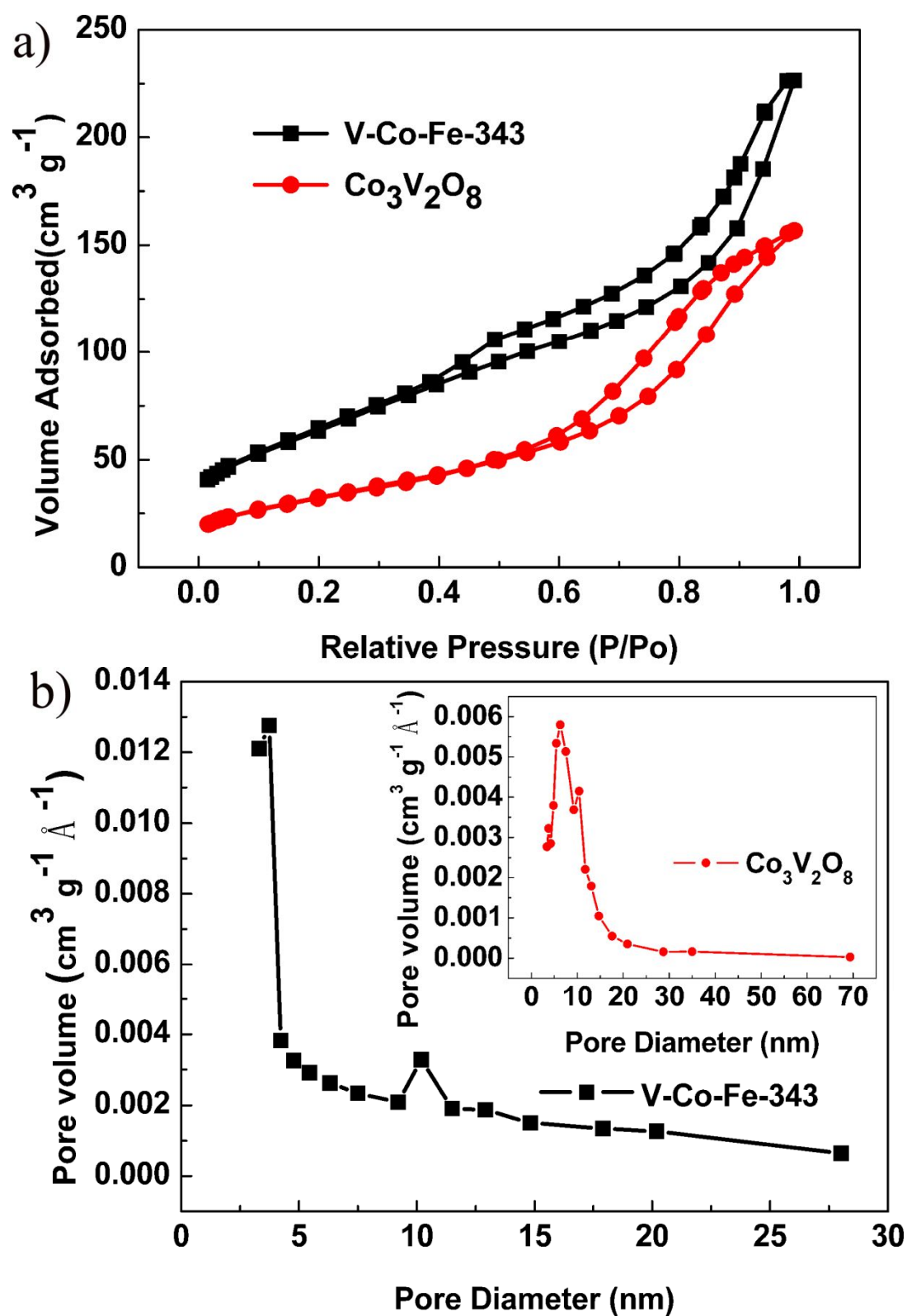


Fig S3. a) N_2 adsorption-desorption isotherm and b) the pore size distribution of $\text{Co}_3\text{V}_2\text{O}_8$ and the V-Co-Fe-343 sample.

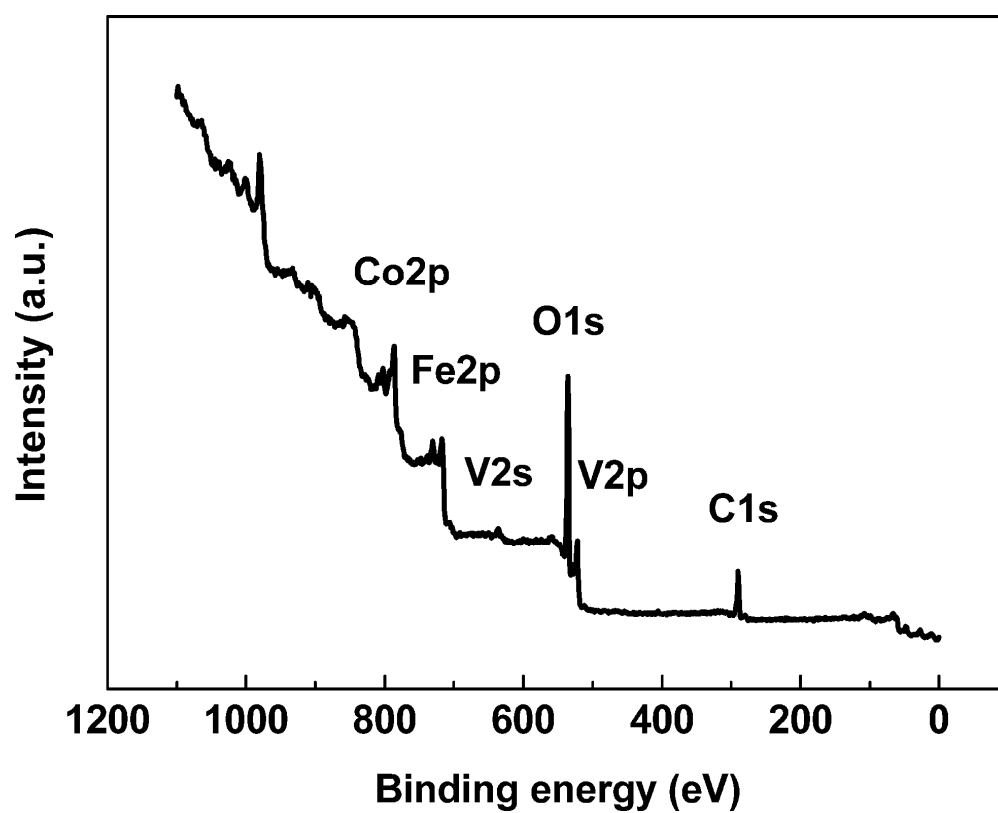


Fig S4. The overall XPS spectra of the V-Co-Fe-343 sample.

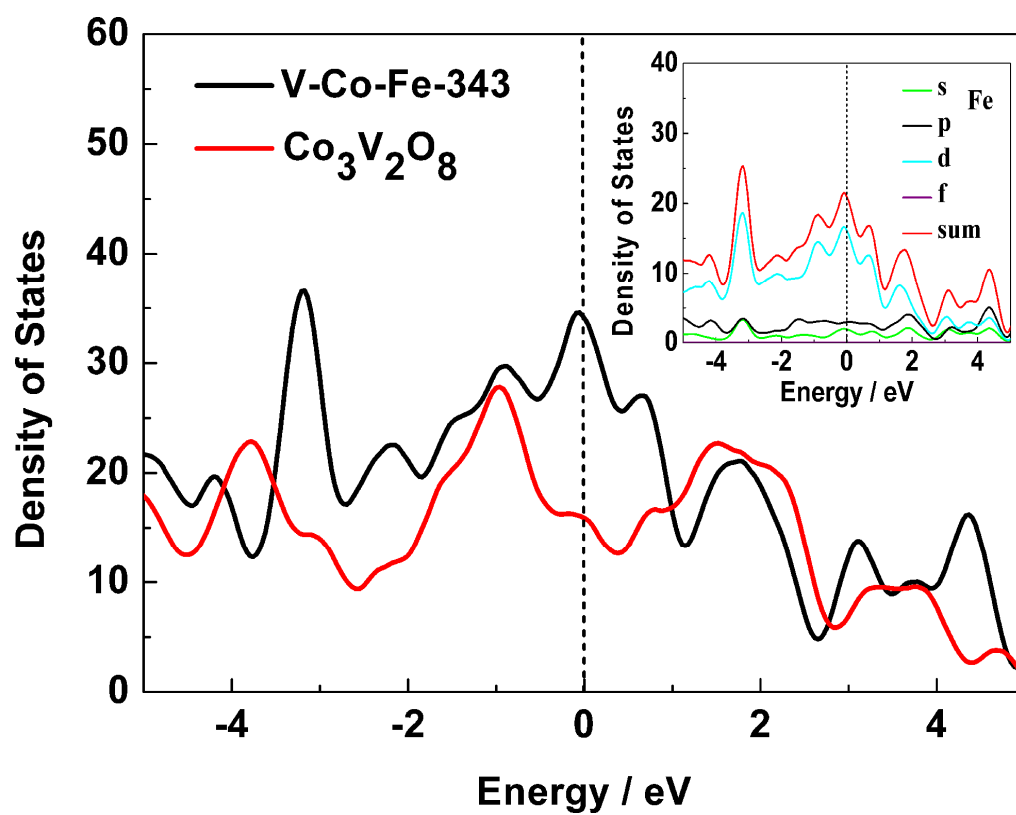


Fig S5. Calculated density of states for $\text{Co}_3\text{V}_2\text{O}_8$ and V-Co-Fe-343. The Fermi level is set at 0 eV.

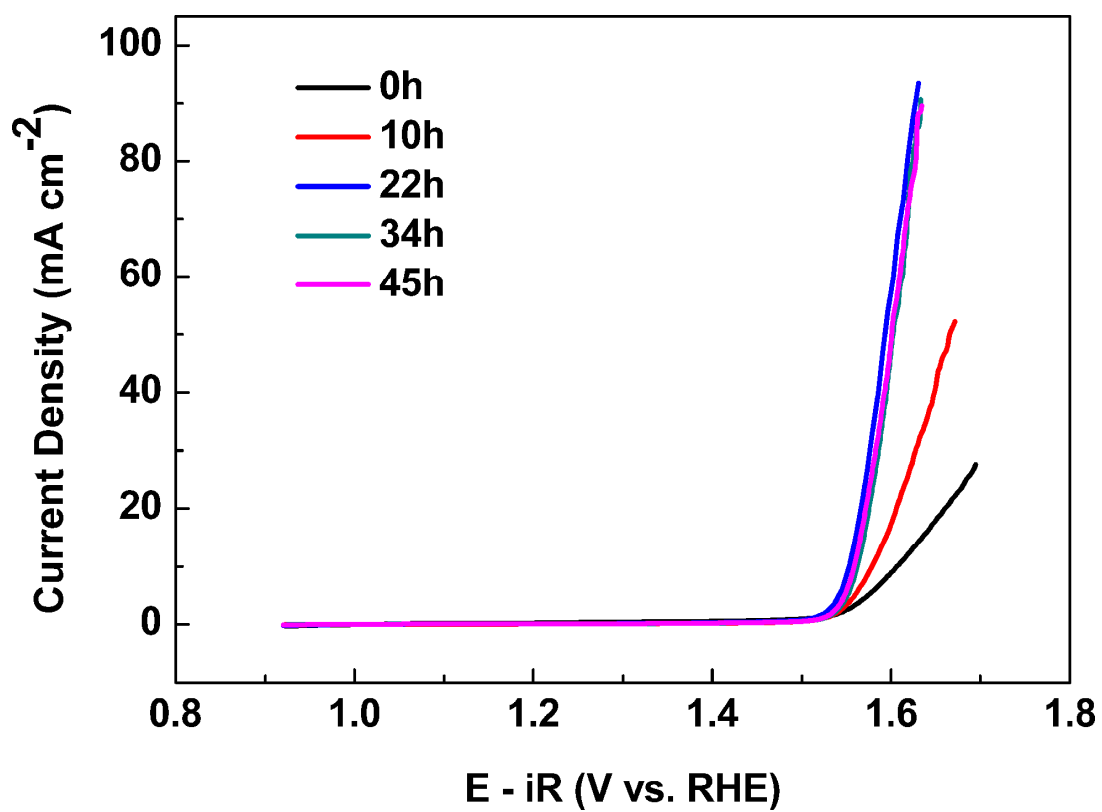


Fig S6. The variation of current density at different reaction time (0 h, 10 h, 22 h, 34 h and 45 h in the oven at 180°C, respectively).

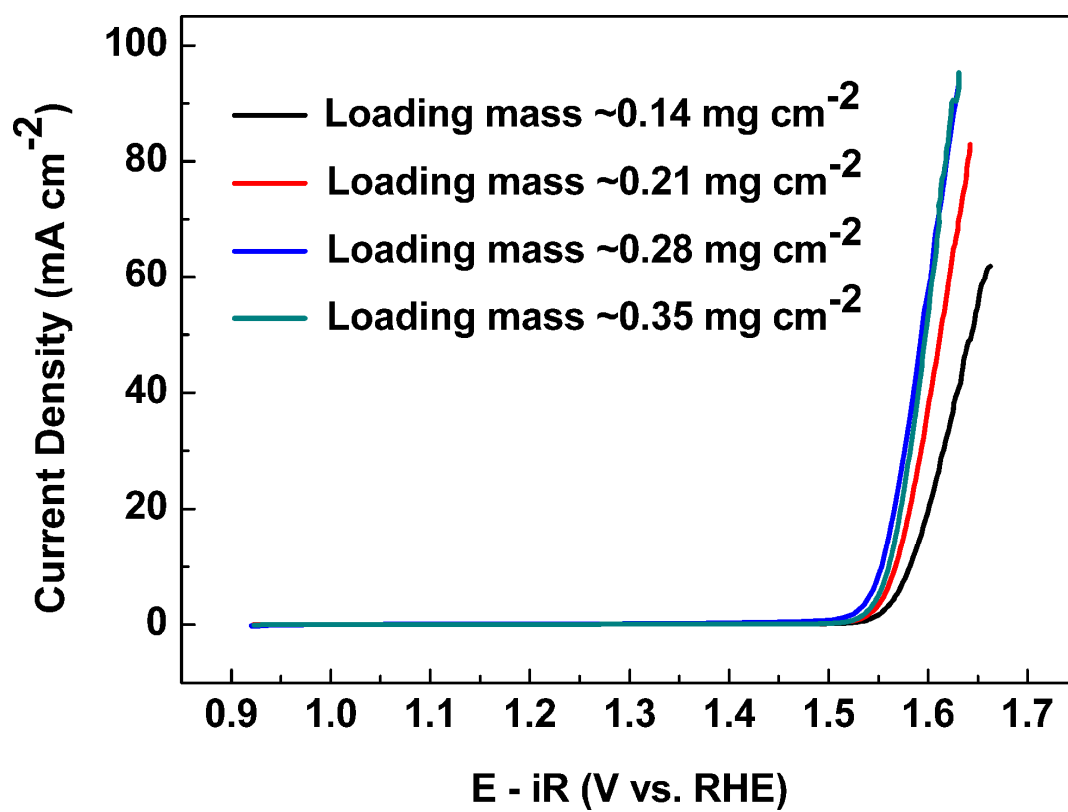


Fig S7. The relationship between the current density and loading of catalyst.

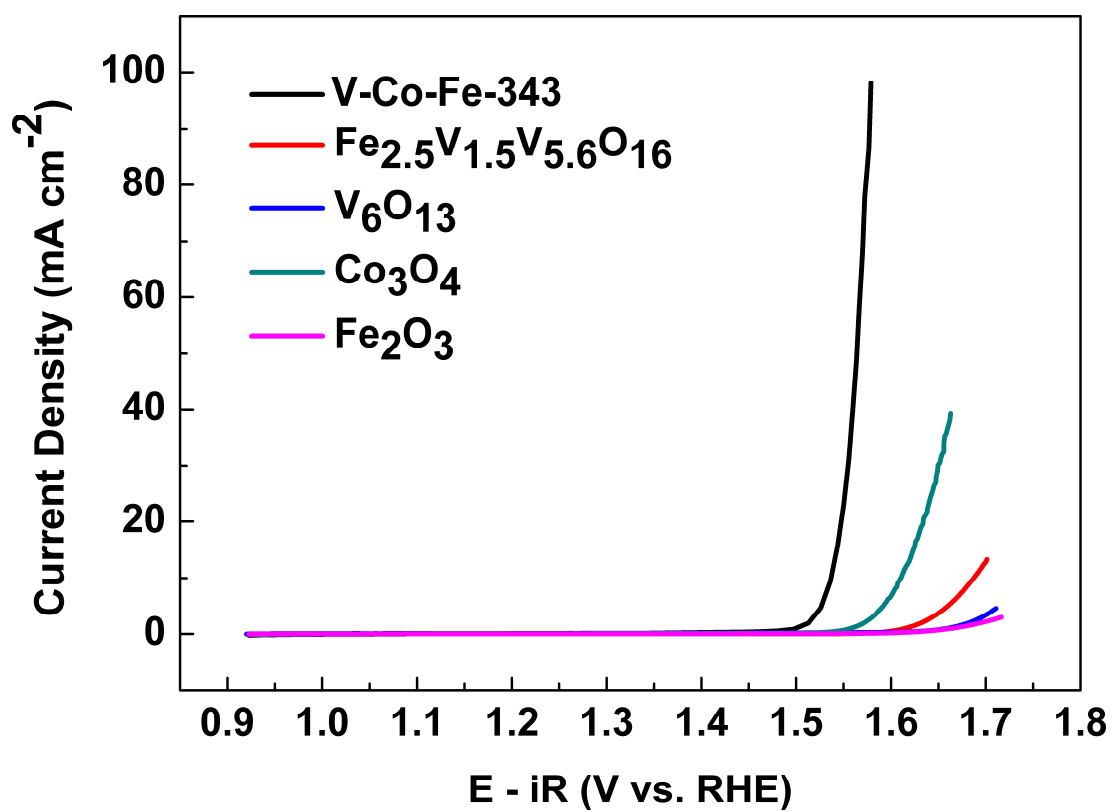


Fig S8. The polarization curves of the V-Co-Fe-343, V₆O₁₃, Co₃O₄, Fe₂O₃ and Fe_{2.5}V_{1.5}V_{5.6}O₁₆ catalysts.

Table S1. Comparison of OER catalytic activity of some similar catalysts

Catalysts	BET special surface area ($\text{m}^2 \text{g}^{-1}$)	Electrolyte	Tafel slope (mV dec^{-1})	Overpotential @ 10 mA cm^{-2} (mV)	Reference
V-Co-Fe-343	232.1	1.0 M KOH	36	307	This work
Co-P film		1.0 M KOH	47	345	S1
NiCo LDH		1.0 M KOH	40	367	S2
$\text{Co}_3\text{V}_2\text{O}_8$	122.8	1.0 M KOH	65	359	S3
Mesoporous Co_3O_4	135	0.1 KOH	80	411	S4
CoMn LDH		1.0 M KOH	43	324	S5
NiFe-LDH/CNT		0.1 KOH	35	308	S6
CoO/CNT	170	1.0 M KOH	108	550	S7
$\text{NiCo}_2\text{O}_4/\text{graphene}$	77	0.1 KOH	161	500	S8
$\text{Zn}_x\text{Co}_{3-x}\text{O}_4$ nanowire		1.0 M KOH	51	330	S9

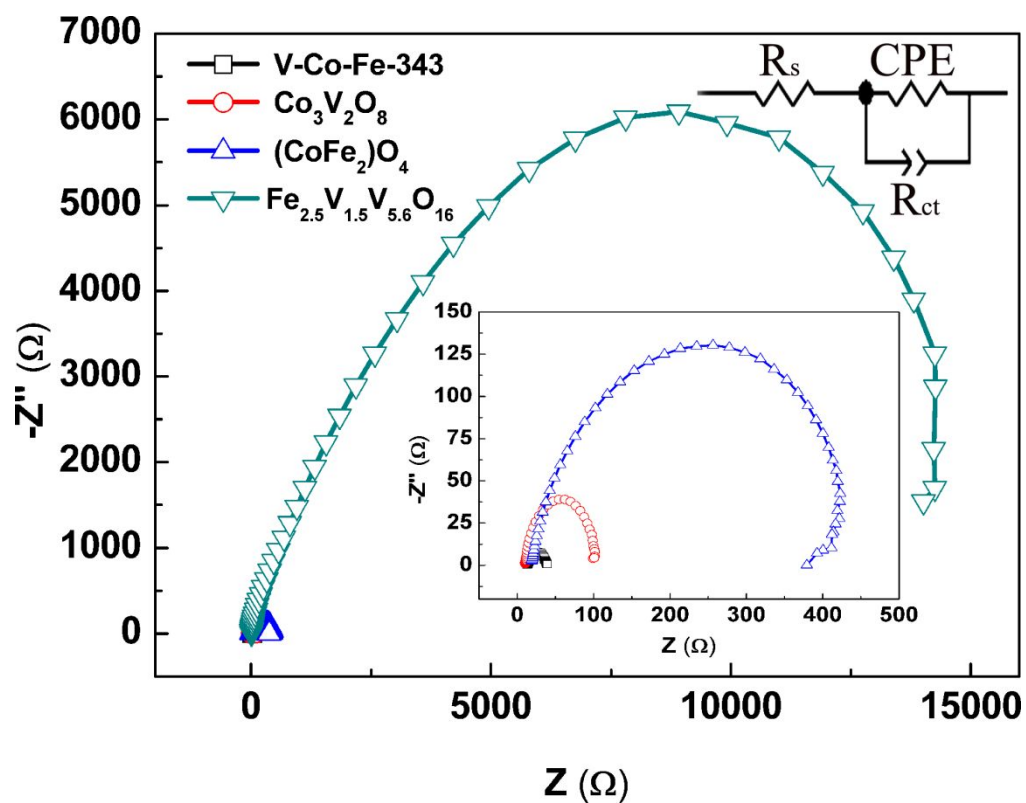


Fig S9. The EIS of $(\text{CoFe}_2)\text{O}_4$, V-Co-Fe-343 and $\text{Fe}_{2.5}\text{V}_{1.5}\text{V}_{5.6}\text{O}_{16}$, $\text{Co}_3\text{V}_2\text{O}_8$ catalysts at 1.55 V vs. RHE, respectively, by loading catalysts on the glassy carbon electrode; the inset illustrates the simplified Randles equivalent circuit.

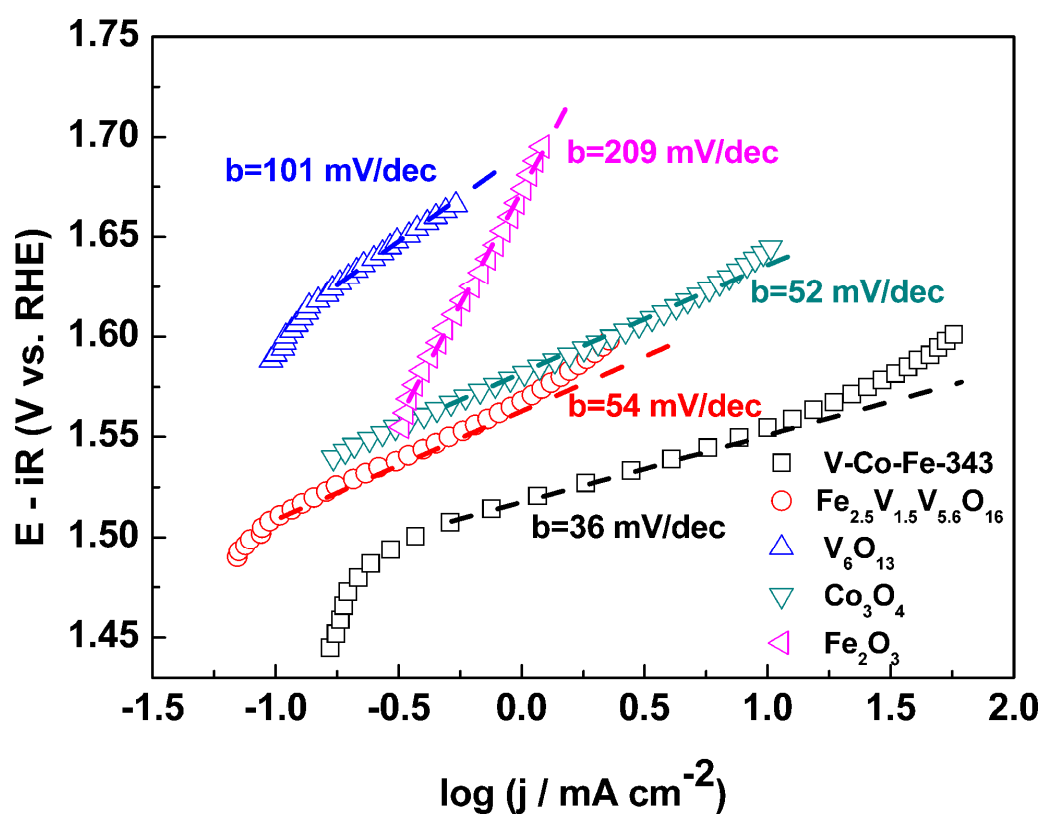


Fig S10. Tafel plots of the V-Co-Fe-343, $\text{Fe}_{2.5}\text{V}_{1.5}\text{V}_{5.6}\text{O}_{16}$, V_6O_{13} , Co_3O_4 and Fe_2O_3 catalysts.

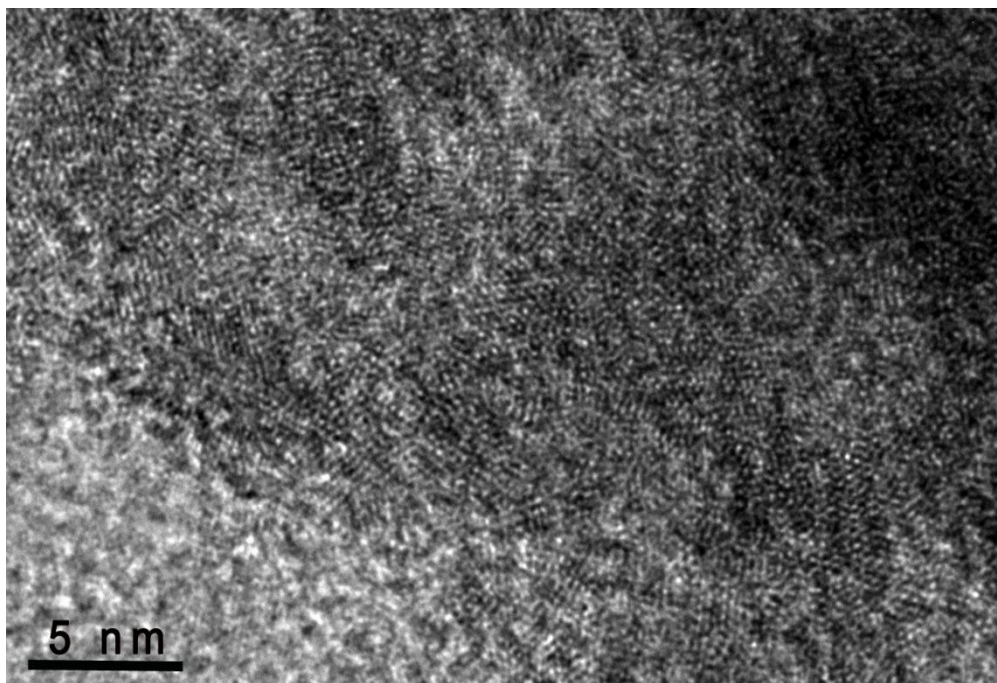


Fig S11. HRTEM images of the V-Co-Fe-343 sample after 100 cycles cyclic voltammetry from 0.92 to 1.62 V vs RHE at a sweep rate of 50 mV s⁻¹.

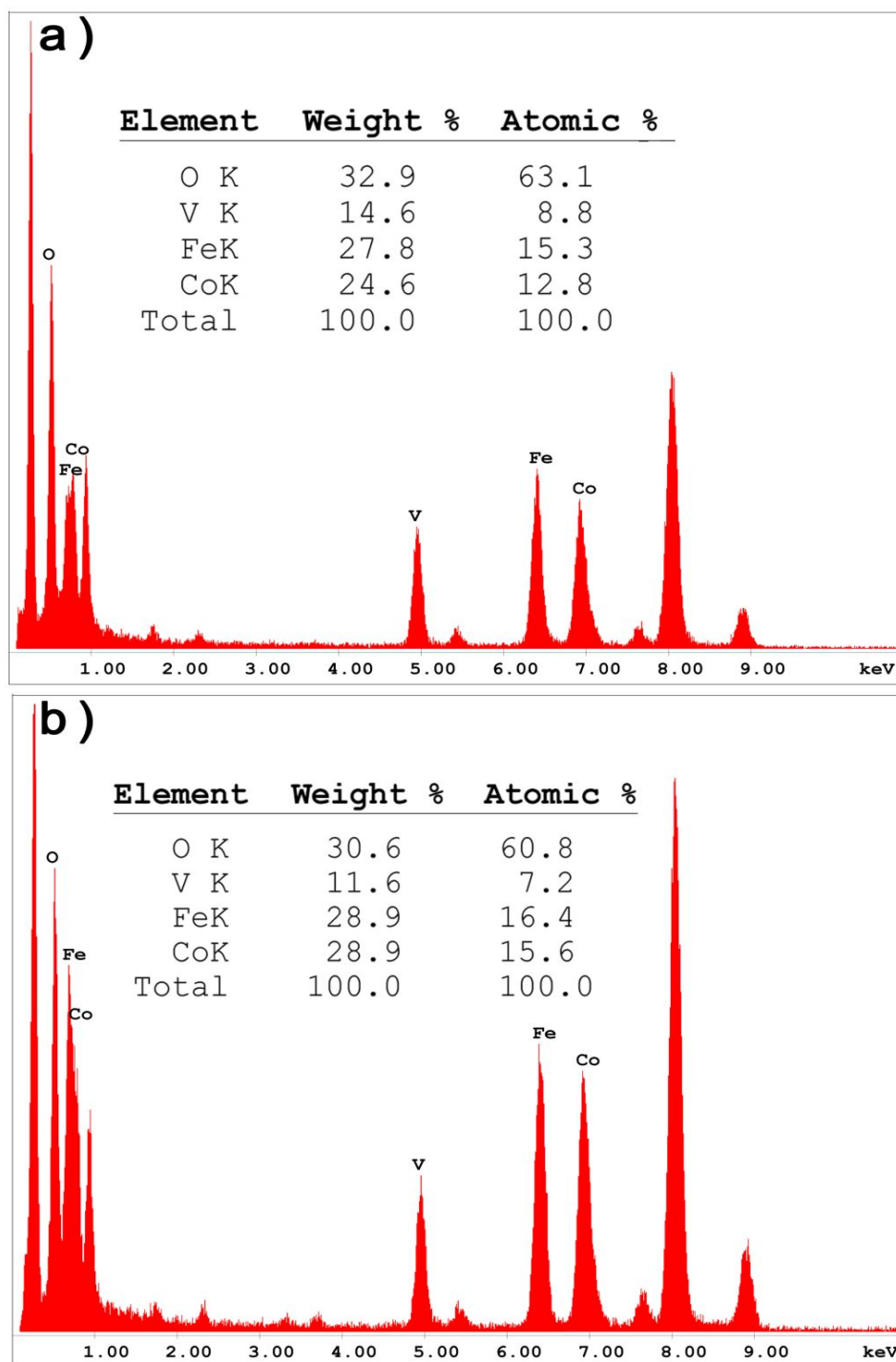


Fig S12. EDS spectrum of the V-Co-Fe-343 catalyst before (a) and after (b) 100 cycles cyclic voltammetry from 0.92 to 1.62 V vs RHE at a sweep rate of 50 mV s⁻¹.

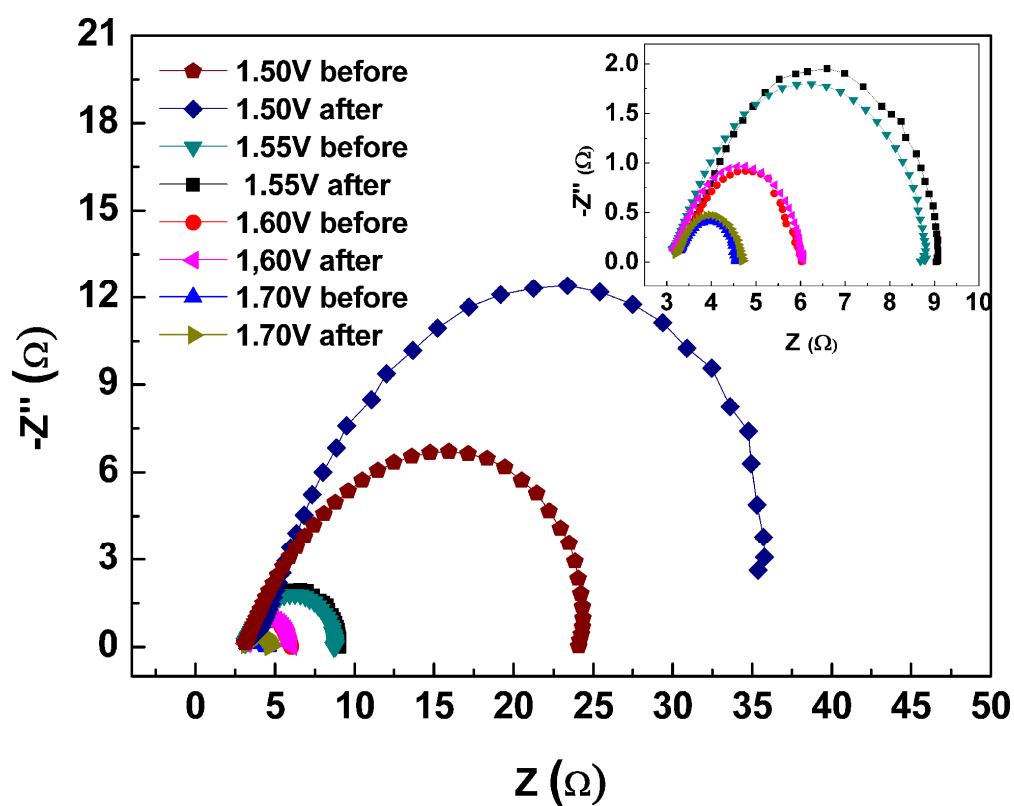


Fig S13. The ESI of catalysts at different potential before and after stability testing.