Supporting Information

A novel monoclinic metal oxide catalyst for oxygen evolution reaction in alkaline media

Yang Qian[a], Xianlun Xu[a], Yi He [a] , Lecheng Lei[a,b], Yanghong Xia[c], Xingwang Zhang[a,b,*]

[a] Key Laboratory of Biomass Chemical Engineering of Ministry of Education, College of Chemical and Biological Engineering, Zhejiang University, Zheda Road No. 38, 310027 Hangzhou, China

[b] Institute of Zhejiang University-Quzhou, 324000 Quzhou, China

[c] Zhejiang University Zero-Carbon Emission Renewable Energy Laboratory, College of Electrical Engineering, Zhejiang University, Zheda Road No. 38, 310027 Hangzhou, China

E-mail: xwzhang@zju.edu.cn

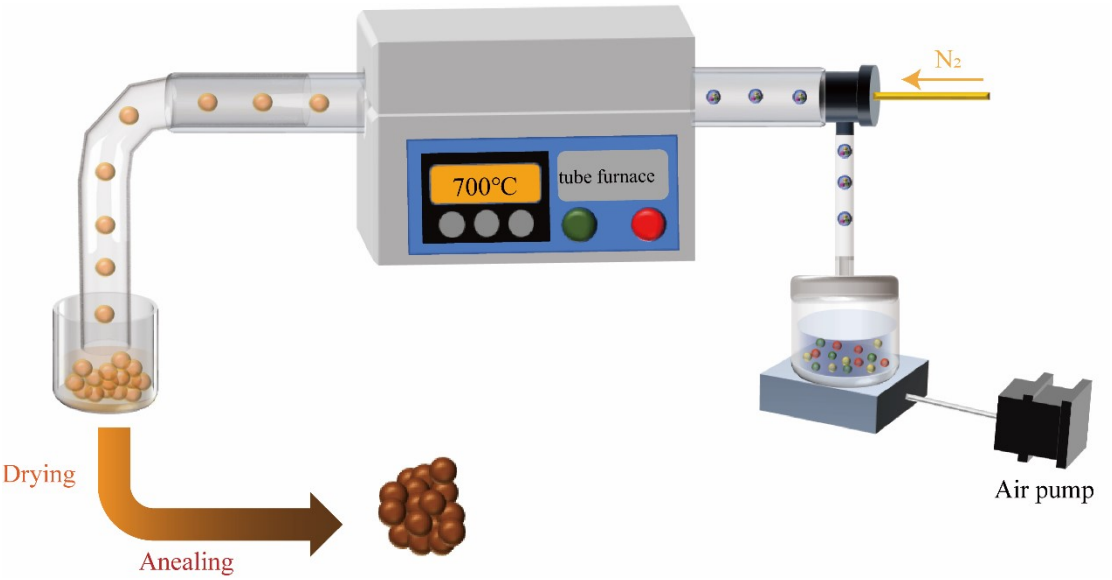

Figure S1. Synthesis strategy of Co_x-$Fe_2(MoO_4)_3$.

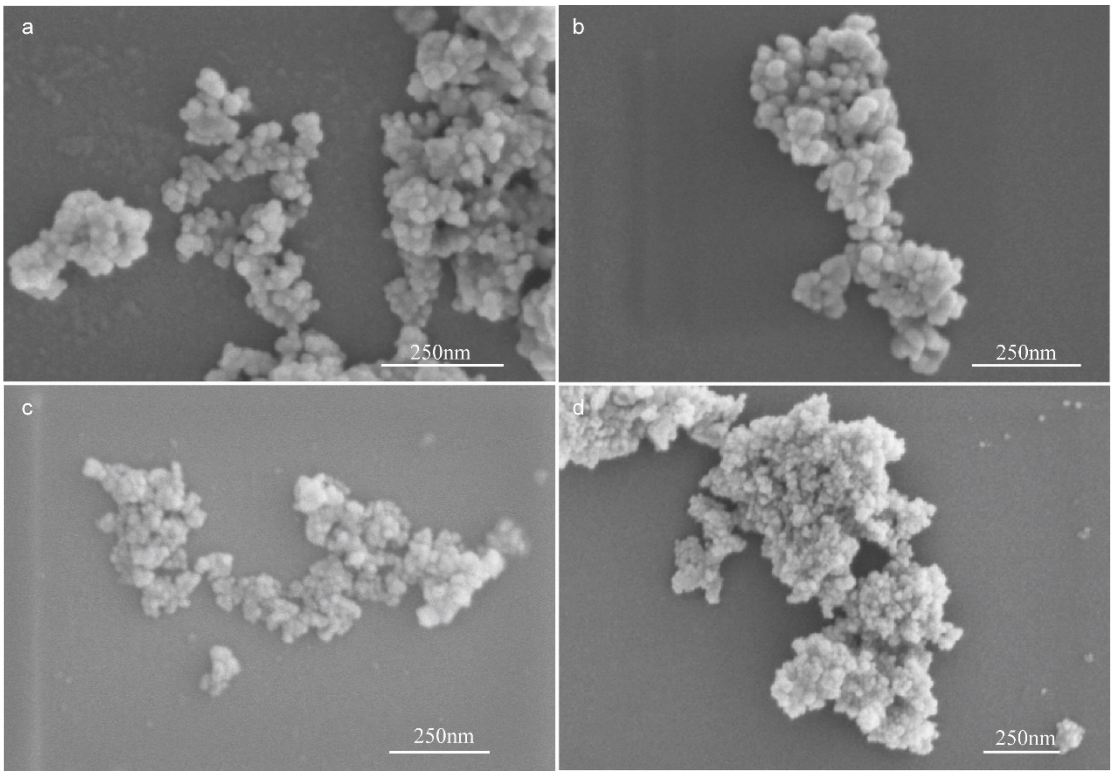

Figure S2. SEM images of (a) pure $Fe_2(MoO_4)_3$, (b) $Co_{0.05}$-$Fe_2(MoO_4)_3$, (c) $Co_{0.1}$-$Fe_2(MoO_4)_3$, (d) $Co_{0.2}$-$Fe_2(MoO_4)_3$.

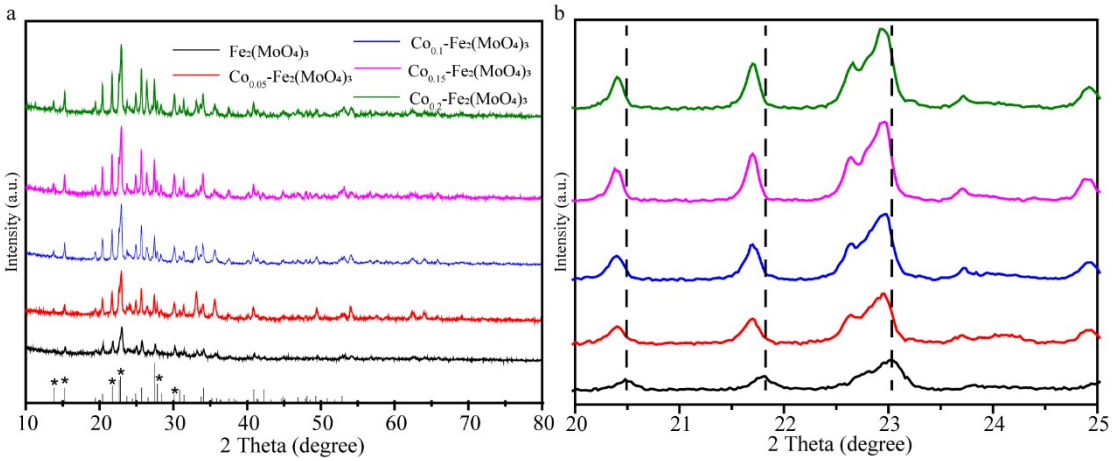

Figure S3. XRD patterns for with $Fe_2(MoO_4)_3$ different cobalt doping ratio.

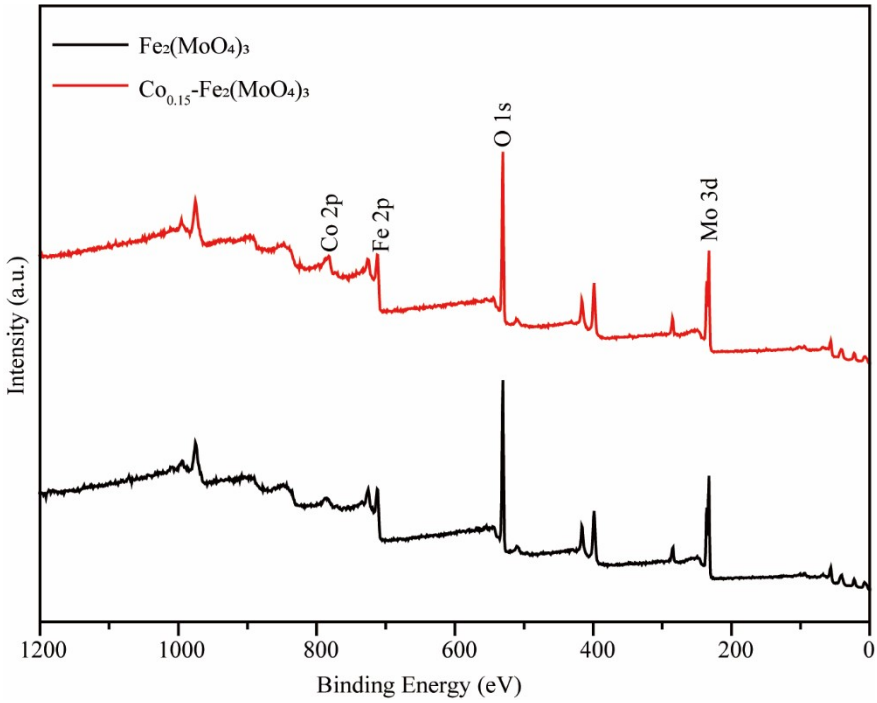

Figure S4. Full XPS survey scan for $Fe_2(MoO_4)_3$ and $Co_{0.15}$-$Fe_2(MoO_4)_3$.

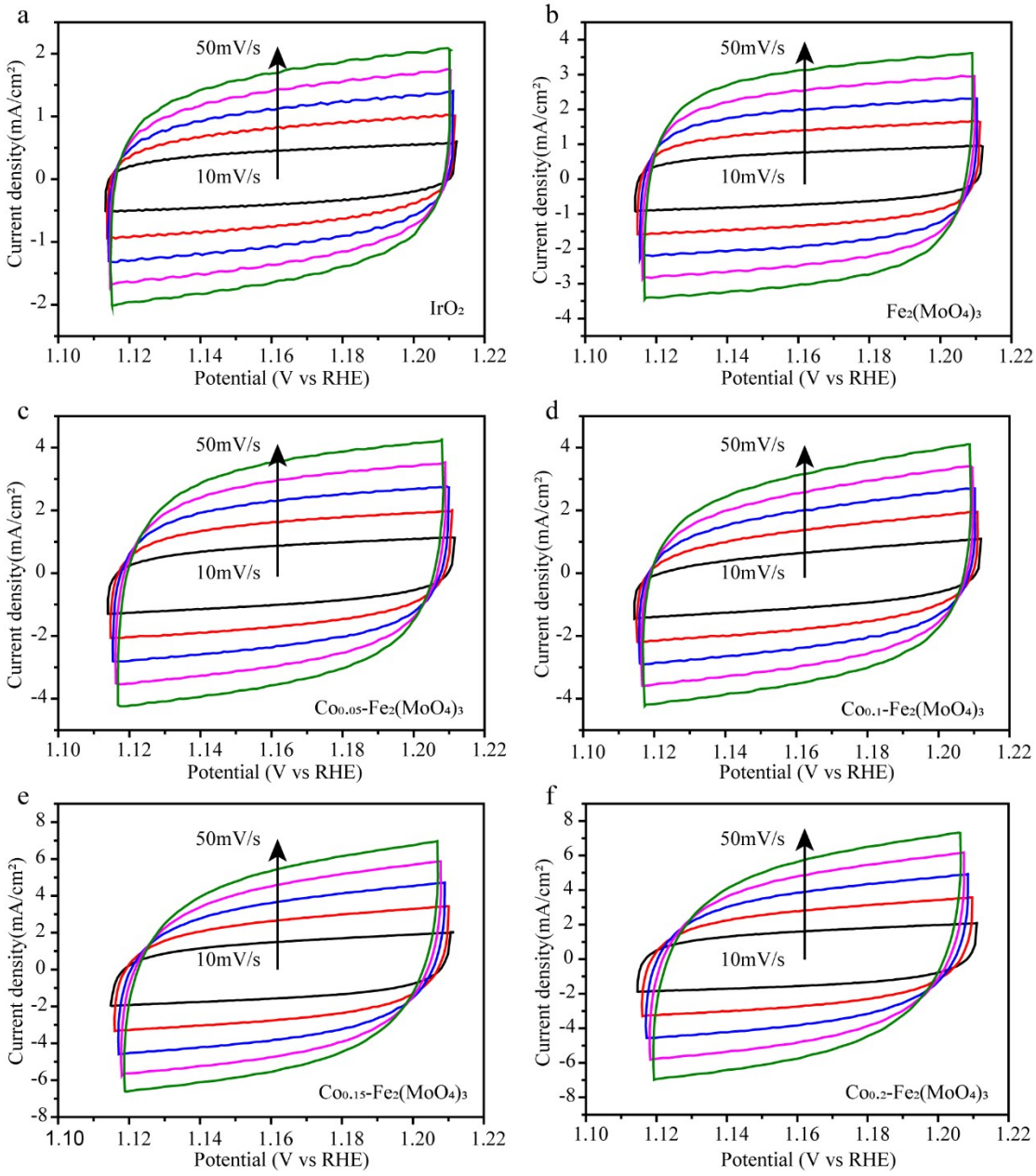

Figure S5. CV diagrams of (a) IrO_2, (b) $Fe_2(MoO_4)_3$, (c) $Co_{0.05}$-$Fe_2(MoO_4)_3$, (d) $Co_{0.1}$-$Fe_2(MoO_4)_3$, (e) $Co_{0.15}$-$Fe_2(MoO_4)_3$, (f) $Co_{0.2}$-$Fe_2(MoO_4)_3$.

Table S1 Comparison between $Co_{0.15}$- $Fe_2(MoO_4)_3$ of this work and different reported transition metal oxide catalysts for OER in alkaline media

Catalyst	Overpotential (mV) at 10mA cm^{-2}	Stability	Reference
$Co_3O_{3.87}F_{0.13}$	430	1500 cycles	[1]
$CoVO_x$-300	330	10h	[2]
$NiCo_{1.7}Ru_{0.3}O_4$	280	15h	[3]
Co/CoO@NC@CC	284	25h	[4]
NiMn/ $NiCo_2O_4$	310	8h	[5]
Co@Co_3O_4/NC-2	410	45h	[6]
$CoMoO_x/CoMoS_x/CoS_x$	281	40h	[7]
CoV_2O_6	324	24h	[8]
Geobacter-Mn_2O_3	290	22.5h	[9]
$Co_{0.708}Fe_{0.292}WO_4$	327	7h	[10]
$CoMoO_4$ nanorod	350	10h	[11]
$LaSr_3Co_{1.5}Fe_{1.5}O_{10-\delta}$	388	5h	[12]
$Co_{0.15}$-$Fe_2(MoO_4)_3$	273	80h	This work

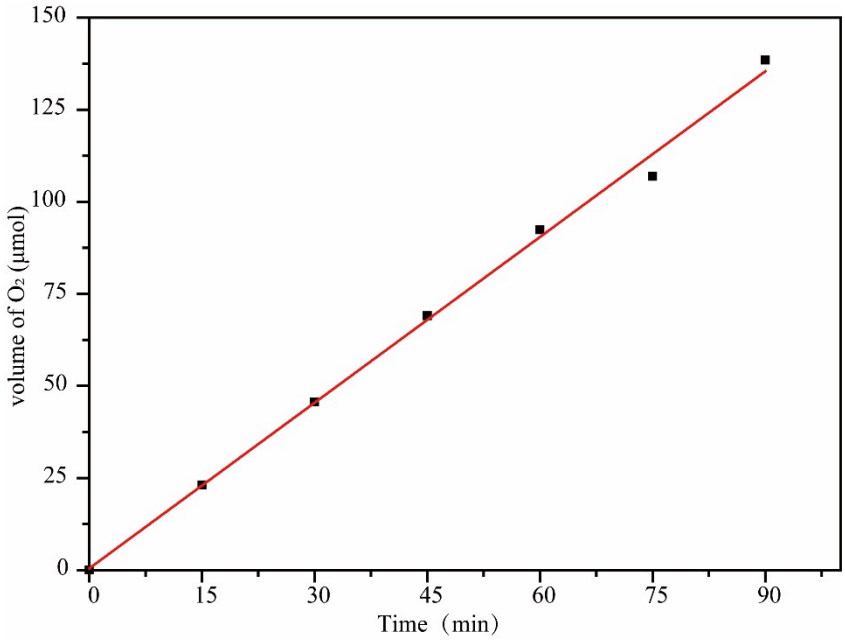

Figure S6. Content of O_2 generated of OER for $Co_{0.15}$-$Fe_2(MoO_4)_3$.

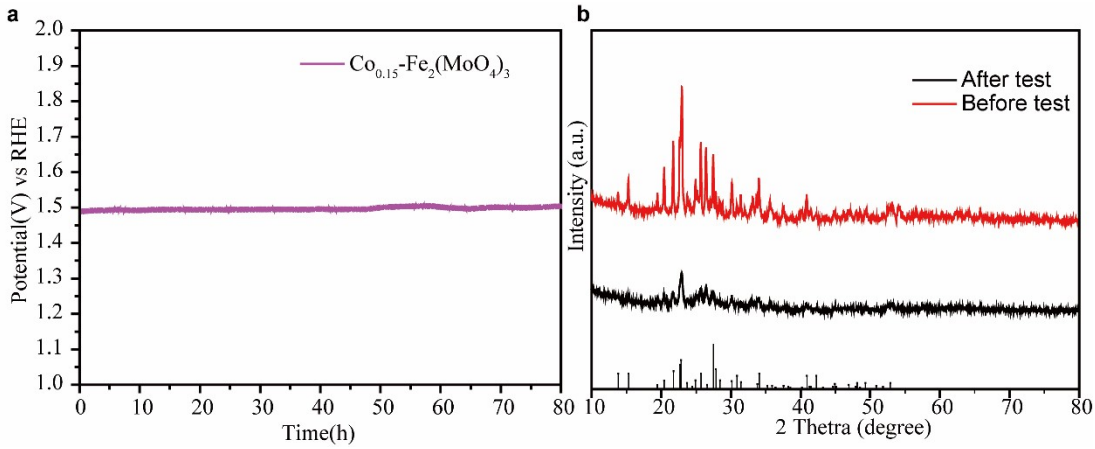

Figure S7. (a) Chronopotentiometry durability test under 10 mA cm^{-2} for $Co_{0.15}$-$Fe_2(MoO_4)_3$, (b) The comparison diagram for XRD patterns of $Co_{0.15}$-$Fe_2(MoO_4)_3$ before and after stability test.

The chemical equations of OER mechanism in alkaline media[13, 14]:

$$M + OH^- \rightarrow MOH + e^- \quad (1)$$

$$MOH + OH^- \rightarrow MO + H_2O_{(l)} + e^- \quad (2)$$

$$MO + OH^- \rightarrow MOOH + e^- \quad (3.1)$$

$$2MO \rightarrow M + O_{2(g)} \quad (3.2)$$

$$O^* + H_2O + H^+ + e^- \rightarrow OH^* + H_2O \quad (4)$$

The active site is written as "M". In most cases, the reaction process follows the steps of (1) → (2) → (3.1) → (4) instead of (1) → (2) → (3.2)

Table S2. ICP analysis for as-prepared $Co_{0.15}$-$Fe_2(MoO_4)_3$

Catalysts	Element	Sample amount	Element Content	wt%
$Co_{0.15}$-$Fe_2(MoO_4)_3$	Co	108.7 mg	16276.45 mg/kg	1.628
	Fe	108.7 mg	171320.15 mg/kg	17.132
	Mo	108.7 mg	461591.54 mg/kg	46.159

Reference

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