

## **Supporting Information**

### **BaLaIr Double Mixed Metal Oxides as a Competitive Catalyst for Oxygen Evolution Electrocatalysis in Acid**

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**Fig. S13.** CV curves recorded at different scan rates for the catalysts prepared with the different calcination temperatures: a) 1000 °C, b) 1400 °C. c) The  $C_{dl}$  of catalysts prepared with different calcination temperatures.

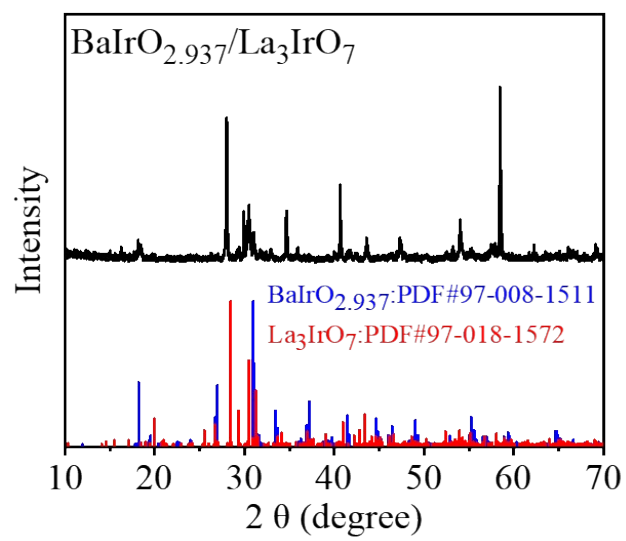
**Table S1.** Comparison of the overpotentials at 10 mA cm<sup>-2</sup> with recently reported OER catalysts in acidic media

## **Characterizations**

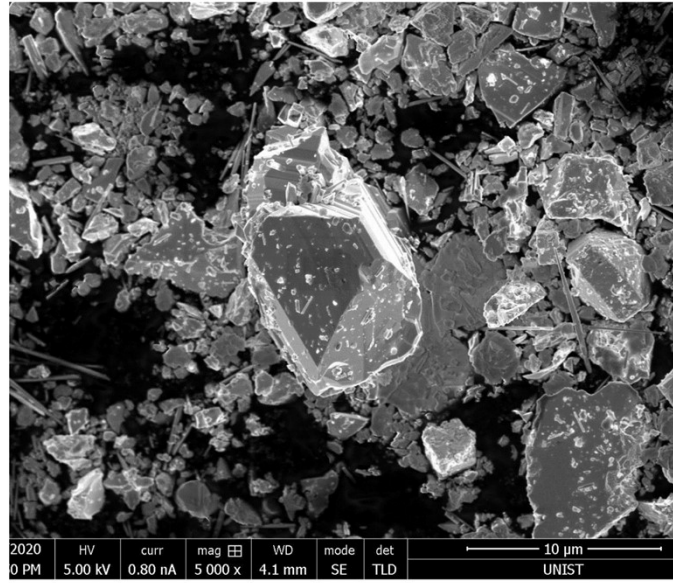
A Bruker D8 Focus Diffraction system was used to record X-ray diffraction patterns with Cu K $\alpha$  radiation. The SEM images were recorded by Hitachi S4800 field-emission scanning electron microscope. TEM measurements were performed on a JEOL JEM-2100F coupled with EDX. XPS measurements were carried out on Thermo Scientific ESCALAB 250Xi X-ray photoelectron spectrometer. The XANES and EXAFS of were measured using the BL10c beam line at the Pohang Light Source (PLS-II), Korea.

## **Electrochemical Measurements**

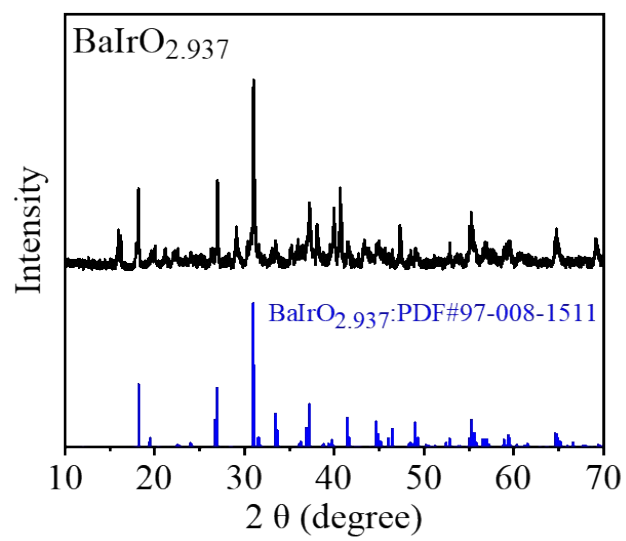
All of the electrocatalysis measurements were performed in a standard three-electrode system, in which graphite rod and the reversible hydrogen electrode were used as counter electrode and reference electrode, respectively. The working electrode was prepared by loading 5 microliters of catalyst ink on a glassy carbon electrode (diameter of 3 mm). The catalyst ink was prepared by uniformly dispersed 2 mg of catalyst and 1 mg of XC-72 in a mixture of 200  $\mu$ L ethanol, 100  $\mu$ L ultrapure water and 40  $\mu$ L Nafion. 0.1 M HClO<sub>4</sub> solution was used as electrolyte. The polarization curves were measured in the potential range of 1.0 V – 1.7 V (vs RHE), with a scanning speed of 5 mV s<sup>-1</sup>. All data were obtained with iR (95 %) compensation. The CVs were tested within the potential of 0.98 V-1.08 V vs RHE to determine the double layer capacitance. The electrochemical stability test was carried out on a titanium mesh with a catalyst load of 1 mg/cm<sup>2</sup>.



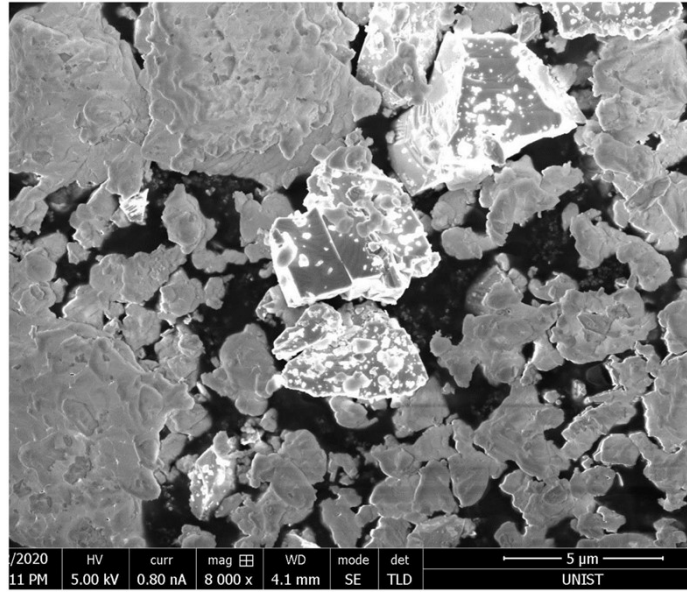
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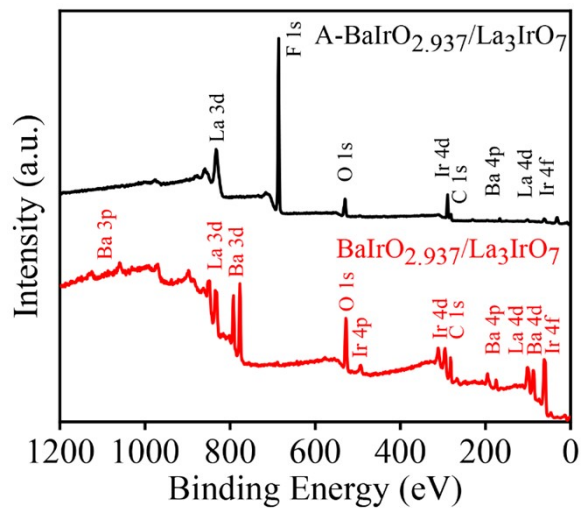


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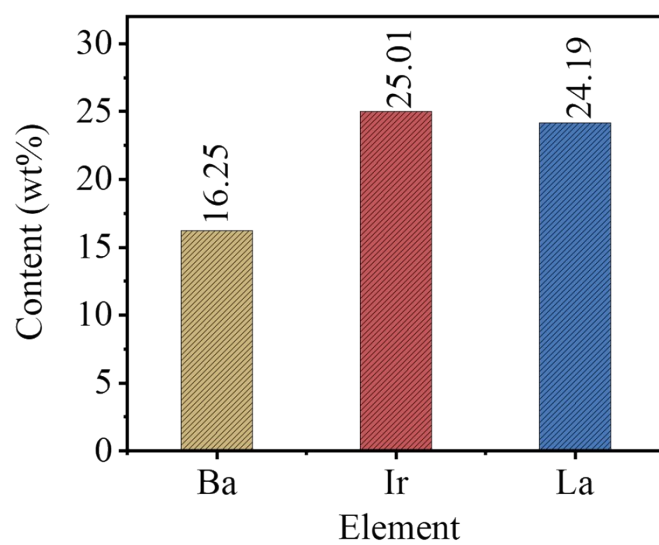


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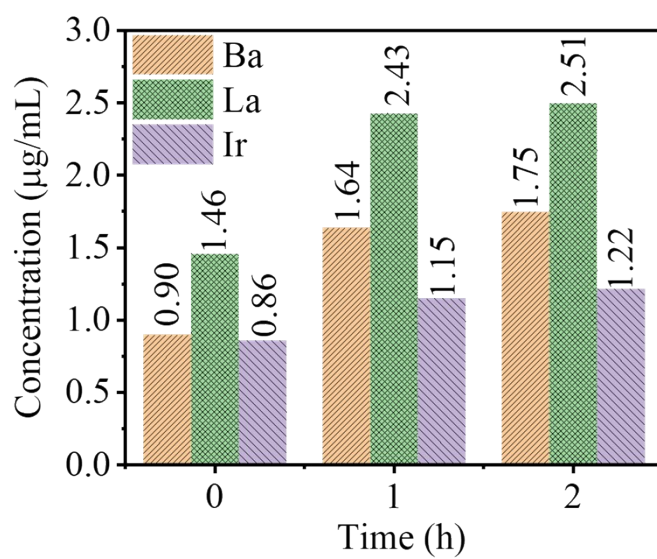




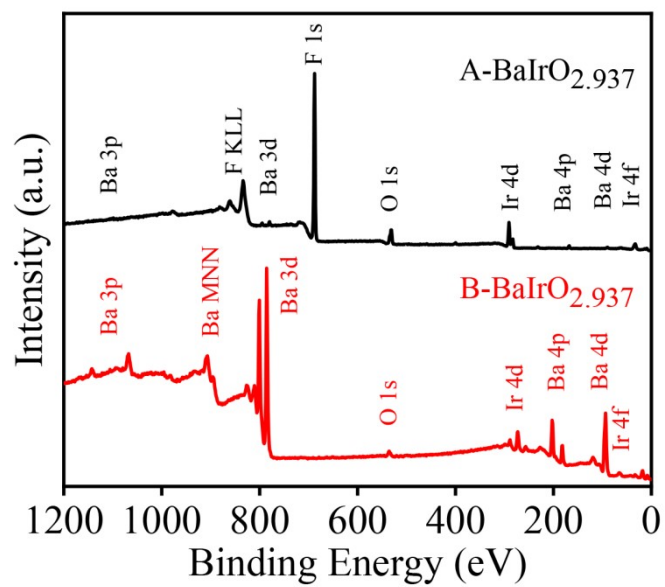
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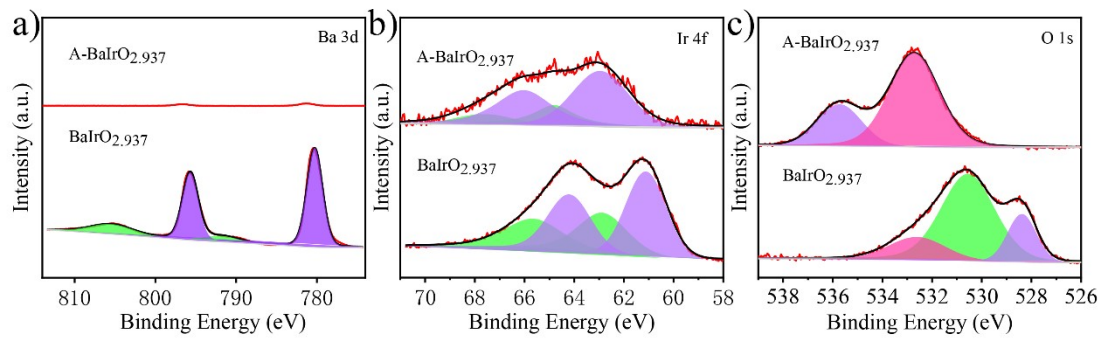
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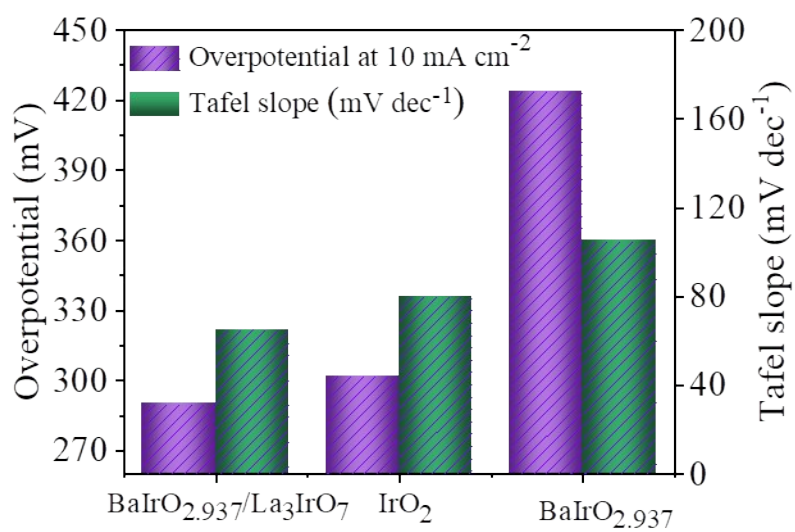
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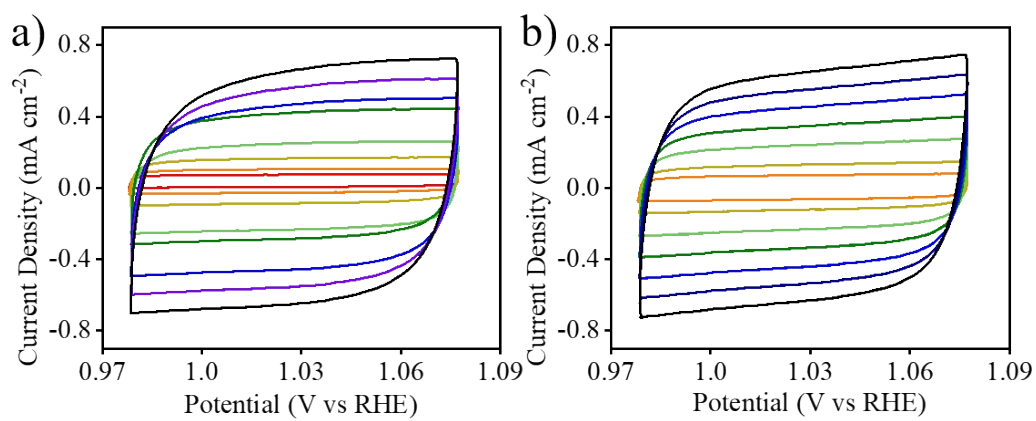
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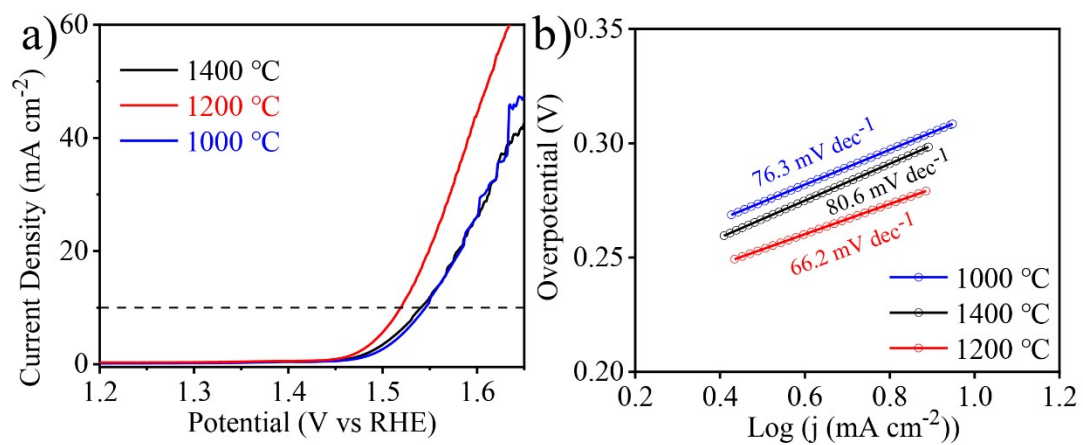
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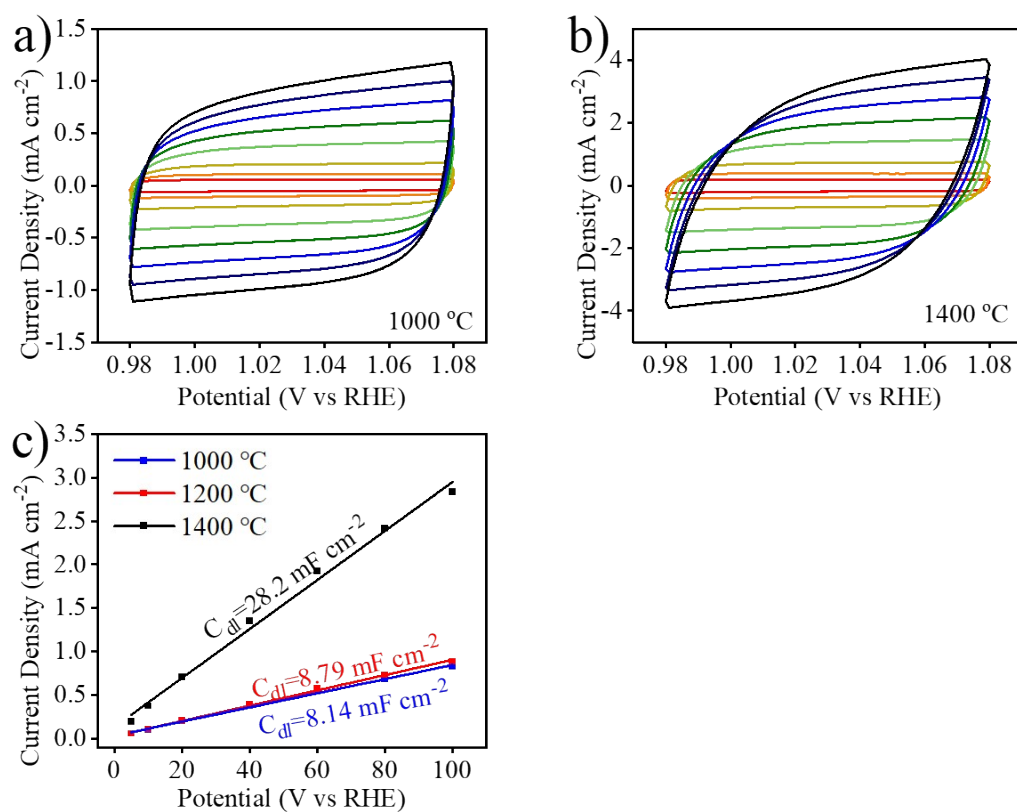


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**Table S1.** Comparison of the overpotentials at 10 mA cm<sup>-2</sup> with recently reported OER catalysts in acidic media

Catalysts	Electrolyte	Overpotential (mV) at 10 mA cm <sup>-2</sup>	References
BaIrO <sub>2.937</sub> /La <sub>3</sub> IrO <sub>7</sub>	0.1 M HClO <sub>4</sub>	290	This work
IrO <sub>x</sub> -Ir	0.5 M H <sub>2</sub> SO <sub>4</sub>	290	1
Ir-Pd	0.5 M H <sub>2</sub> SO <sub>4</sub>	297	2
Ir-Ni mixed oxide film	0.1 M HClO <sub>4</sub>	300	3
La <sub>2</sub> LiIrO <sub>6</sub>	0.5 M H <sub>2</sub> SO <sub>4</sub>	~300	4
IrCoNi	0.1 M HClO <sub>4</sub>	303	5
IrNiCu DNF	0.1 M HClO <sub>4</sub>	303	6
a PN IN	0.1 M HClO <sub>4</sub>	308	7
AuCuIrNi	0.1 M HClO <sub>4</sub>	308	8
Nd <sub>2</sub> Ru <sub>2</sub> O <sub>7</sub>	0.1 M HClO <sub>4</sub>	310	9
IrO <sub>2</sub> Nanoneedle	1 M H <sub>2</sub> SO <sub>4</sub>	313	10
BaYIrO <sub>6</sub>	0.5 M H <sub>2</sub> SO <sub>4</sub>	315	11
IrNiO <sub>x</sub> /Meso-ATO	0.05 M H <sub>2</sub> SO <sub>4</sub>	320	12
SrCo <sub>0.9</sub> Ir <sub>0.1</sub> O <sub>3-δ</sub>	0.1 M HClO <sub>4</sub>	340	13
IrOOH	0.1 M HClO <sub>4</sub>	344	14
Cu <sub>0.3</sub> Ir <sub>0.7</sub> O <sub>x</sub>	0.1 M HClO <sub>4</sub>	350	15
IrNi nanocluster	0.5 M H <sub>2</sub> SO <sub>4</sub>	350	16
Bi <sub>2</sub> Ir <sub>2</sub> O <sub>7</sub>	1 M H <sub>2</sub> SO <sub>4</sub>	350	17
W <sub>0.57</sub> Ir <sub>0.43</sub> O <sub>3-δ</sub> (P)	1 M H <sub>2</sub> SO <sub>4</sub>	370	18
IrCr	0.5 M H <sub>2</sub> SO <sub>4</sub>	395	19
Ir-ND/ATO	0.05 M H <sub>2</sub> SO <sub>4</sub>	400	20

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