

## **Supporting Information**

### **Cation vacancy driven CoFe-LDH-based electrocatalysts for water splitting and Zn-air battery**

Zhenyu Kong,<sup>a</sup> Jingying Chen,<sup>a,c</sup> Xiaoxia Wang,<sup>a</sup> Xiaojing Long,<sup>a</sup> Xilin She,<sup>\*a</sup> Daohao Li<sup>\*a,b</sup> and Dongjiang Yang

<sup>a</sup> *State Key Laboratory of Bio-fibers and Eco-textiles, Shandong Collaborative Innovation Center of Marine Bio-based Fibers and Ecological Textiles, School of Environmental Science and Engineering, Qingdao University, Qingdao 266071, P. R.*

<sup>b</sup> *College of Materials Science and Engineering, Qingdao University, Qingdao 266071, P. R.*

<sup>c</sup> *Department of Blood Transfusion, The Affiliated Hospital of Qingdao University, Qingdao University, Qingdao 266003, P. R.*

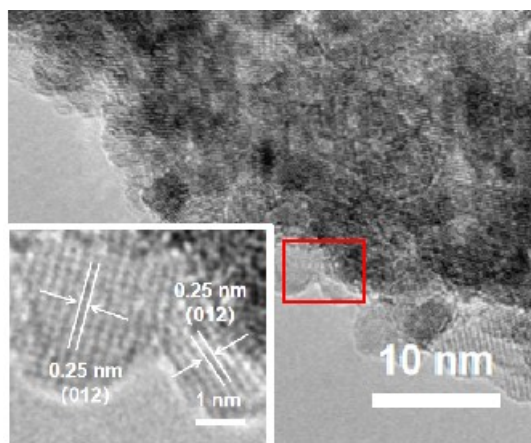
\* *E-mail: [xlshe@qdu.edu.cn](mailto:xlshe@qdu.edu.cn) (X. She); [lidaohao@qdu.edu.cn](mailto:lidaohao@qdu.edu.cn) (D. Li)*

*Zhenyu Kong and Jingying Chen contributed equally to this work.*

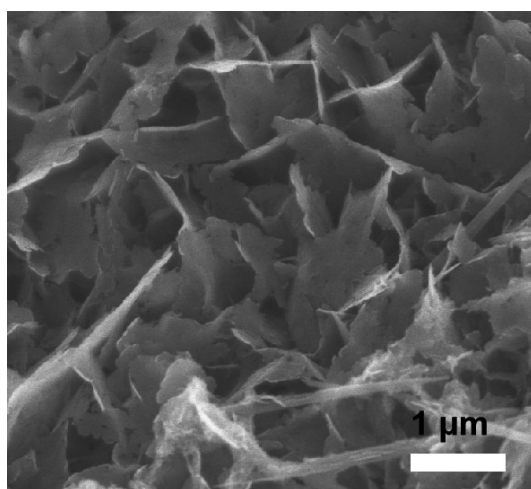
---

## Table Of Contents

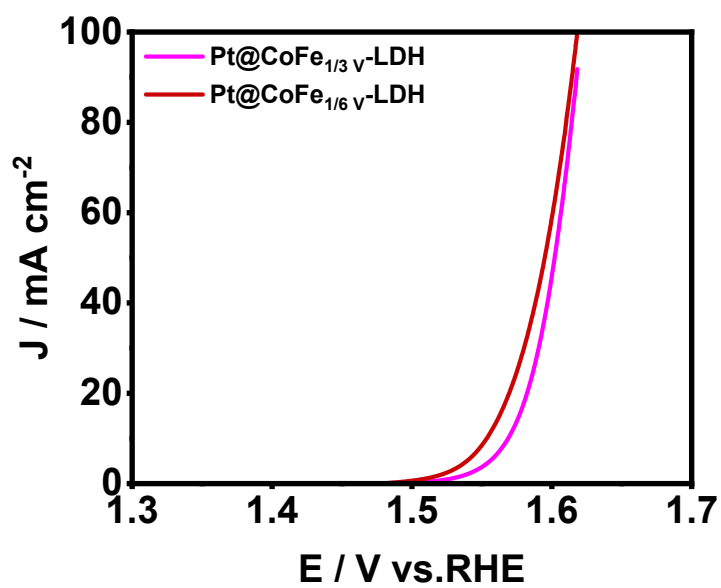
<b>HRTEM (Fig. S1)</b> .....	<b>3</b>
<b>SEM (Fig. S2)</b> .....	<b>3</b>
<b>LSV curves for OER (Fig. S3)</b> .....	<b>3</b>
<b>Histogram of the overpotentials (Fig. S4)</b> .....	<b>4</b>
<b>Tafel slopes (Fig. S5)</b> .....	<b>4</b>
<b>Multistep chronoamperometric curves (Fig. S6-7)</b> .....	<b>5</b>
<b>LSVs before and after 1000 CVs for OER (Fig. S8-9).</b> .....	<b>6</b>
<b>Long-term stability measurement for OER (Fig S10-11)</b> .....	<b>7</b>
<b>Long-term stability measurement for HER (Fig S12-13)</b> .....	<b>8</b>
<b>LSVs before and after 1000 CVs for HER (Fig. S14-15).</b> .....	<b>9</b>
<b>Discharge profile and power density of liquid ZABs (Fig. S16-17)</b> .....	<b>10</b>



**Fig. S1** HRTEM of CoFe<sub>v</sub>-LDH (Inset: Lattice spacing of CoFe-LDH).



**Fig. S2** SEM of CoFe<sub>v</sub>-LDH.



**Fig. S3** LSV curves of Pt@CoFe<sub>v</sub>-LDH for catalyzing the OER in 1.0 M KOH.

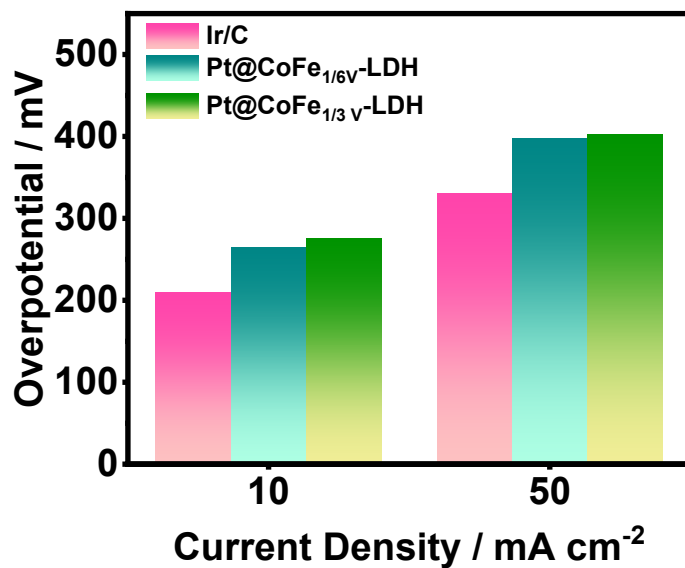


Fig. S4 Histogram of the overpotentials of the Ir/C and Pt@CoFe<sub>v</sub>-LDH to drive 10 mA cm<sup>-2</sup> and 50 mA cm<sup>-2</sup>.

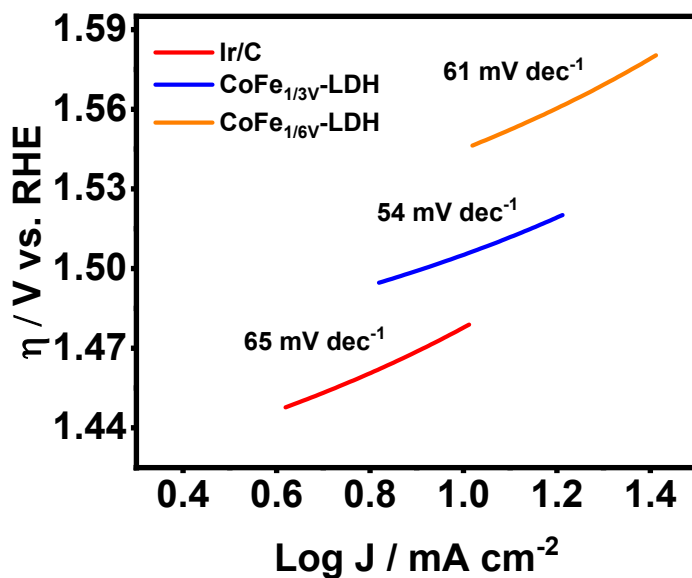


Fig. S5 Tafel slopes of Ir/C and Pt@CoFe<sub>v</sub>-LDH.

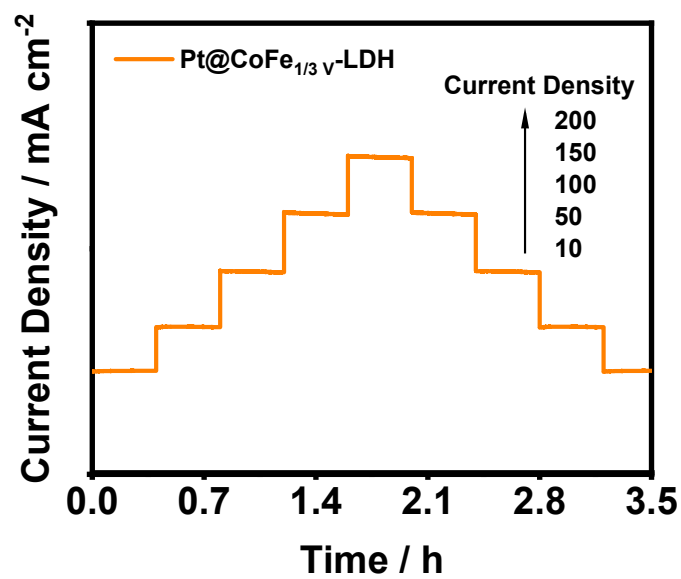


Fig. S6 Multistep chronoamperometric curves of Pt@CoFe<sub>1/3</sub>V-LDH at different applied potentials.

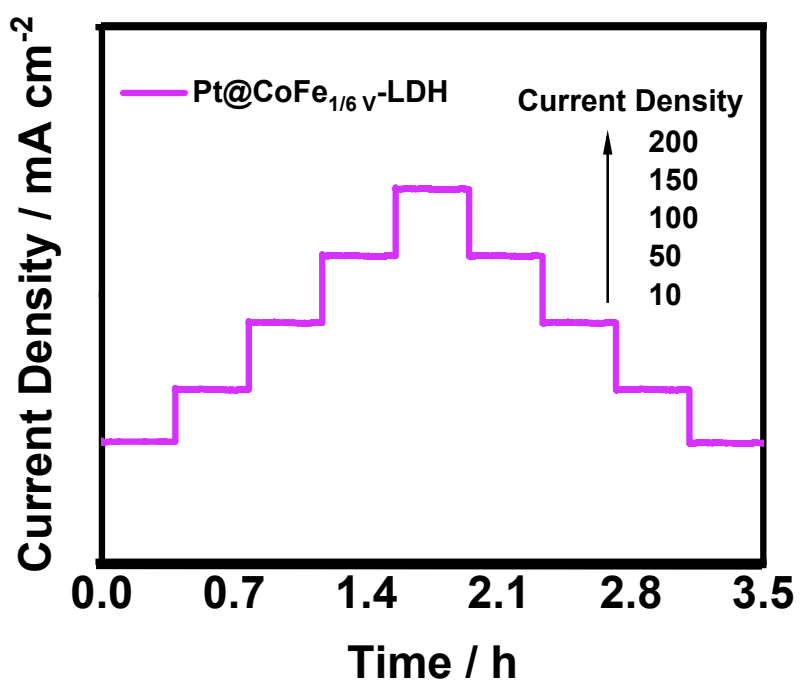
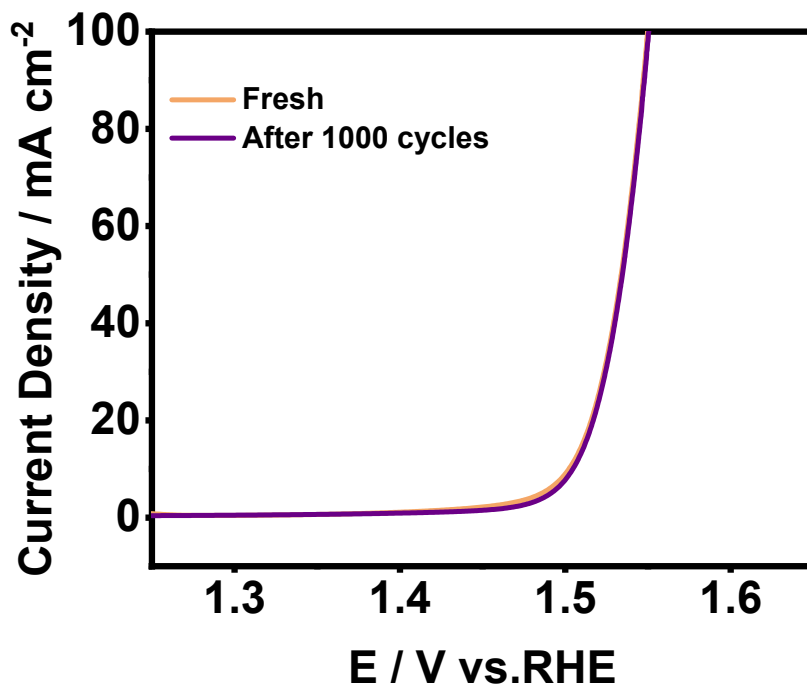
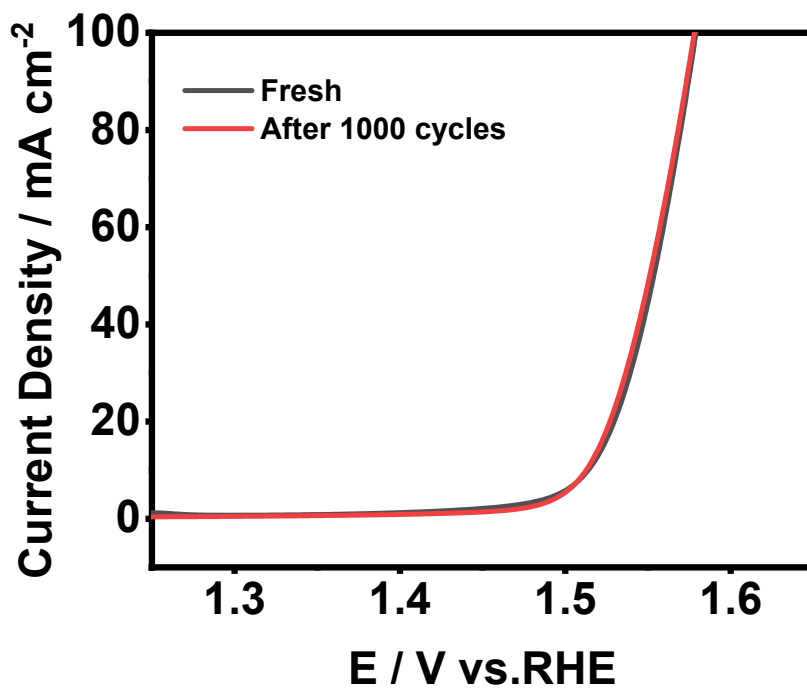


Fig. S7 Multistep chronoamperometric curves of Pt@CoFe<sub>1/6</sub>V-LDH at different applied potentials.



**Fig. S8** The linear scanning voltammograms of Pt@CoFe<sub>1/6</sub>V-LDH before and after 1000 CVs for OER.



**Fig. S9** The linear scanning voltammograms of Pt@CoFe<sub>1/3</sub>V-LDH before and after 1000 CVs for OER.

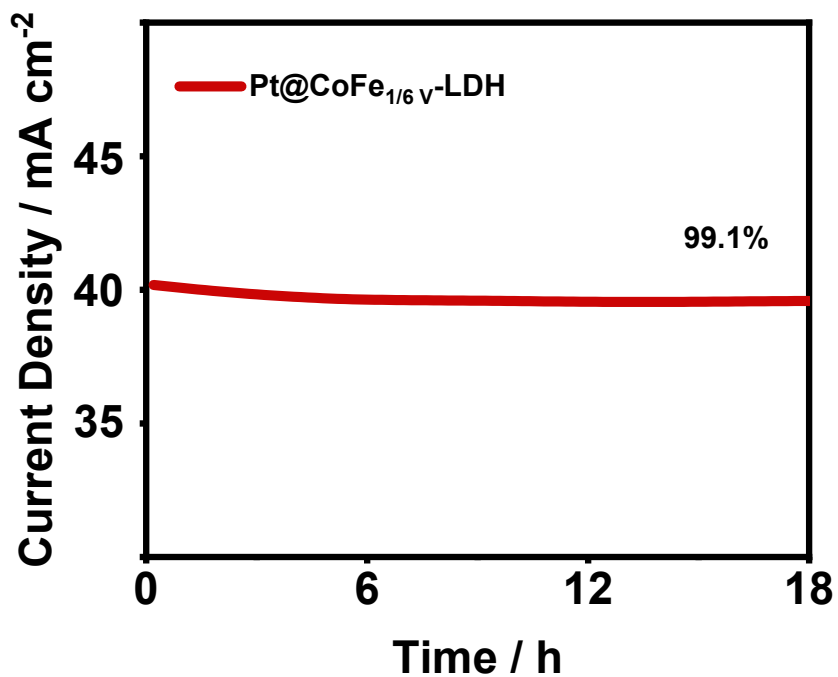


Fig. S10 Long-term stability measurement of the Pt@CoFe<sub>1/6</sub>V-LDH for over 18 h.

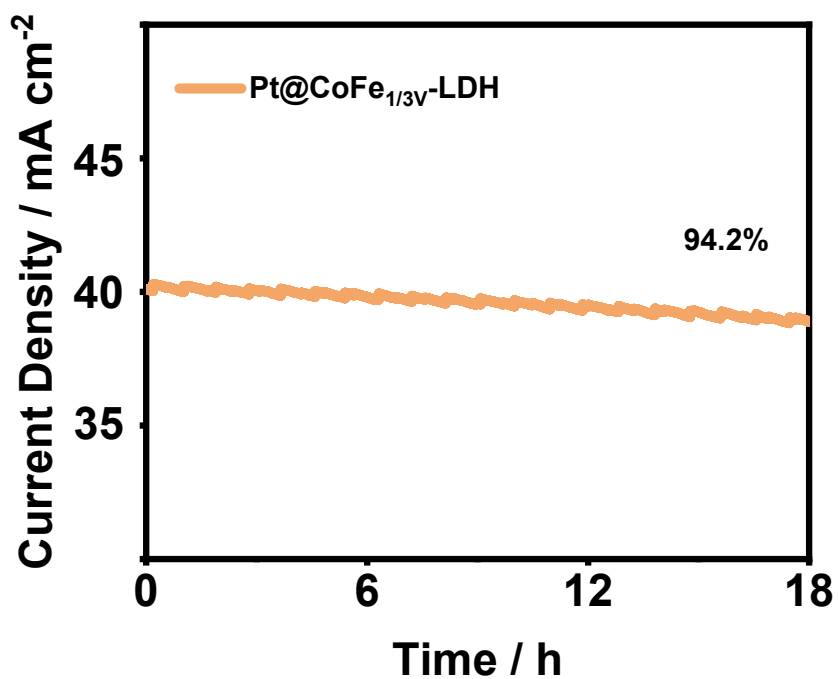


Fig. S11 Long-term stability measurement of the Pt@CoFe<sub>1/3</sub>V-LDH for over 18 h.

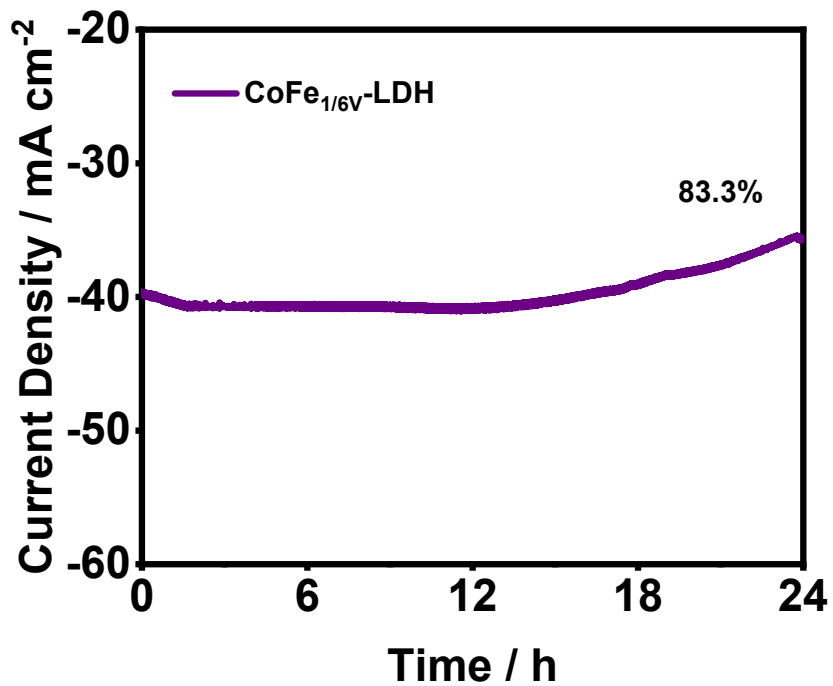


Fig. S12 Long-term stability measurement of the CoFe<sub>1/6</sub>V-LDH for over 24 h.

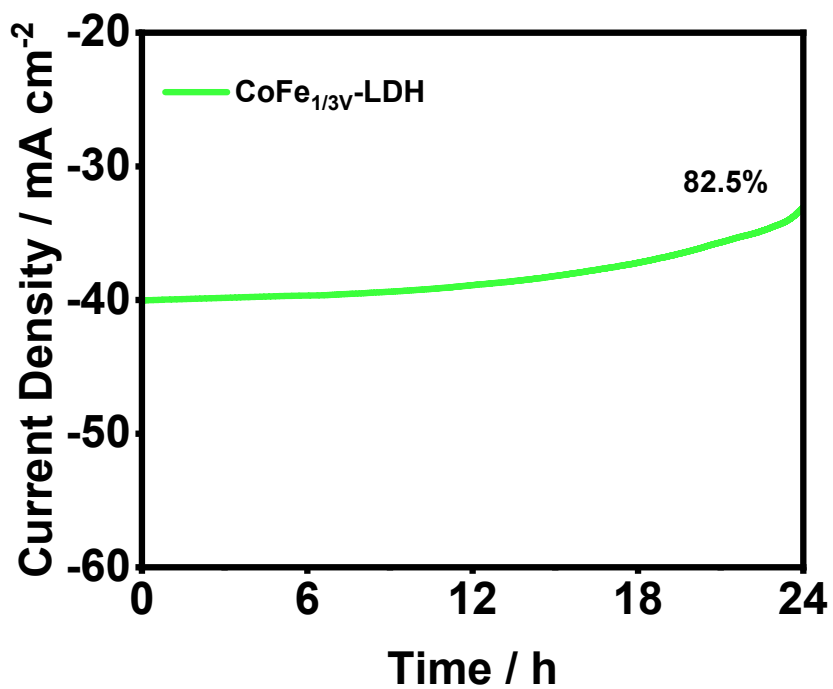
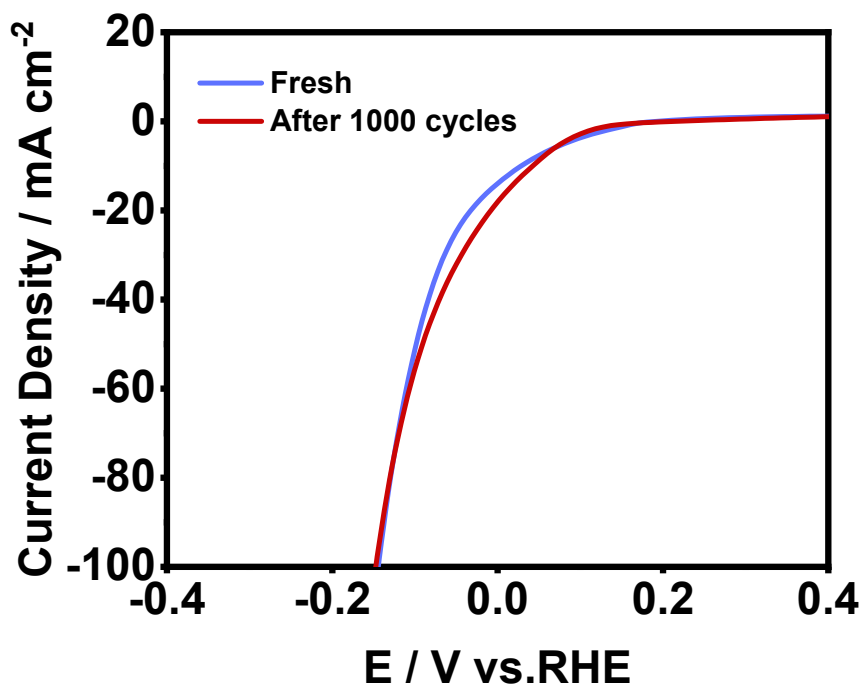
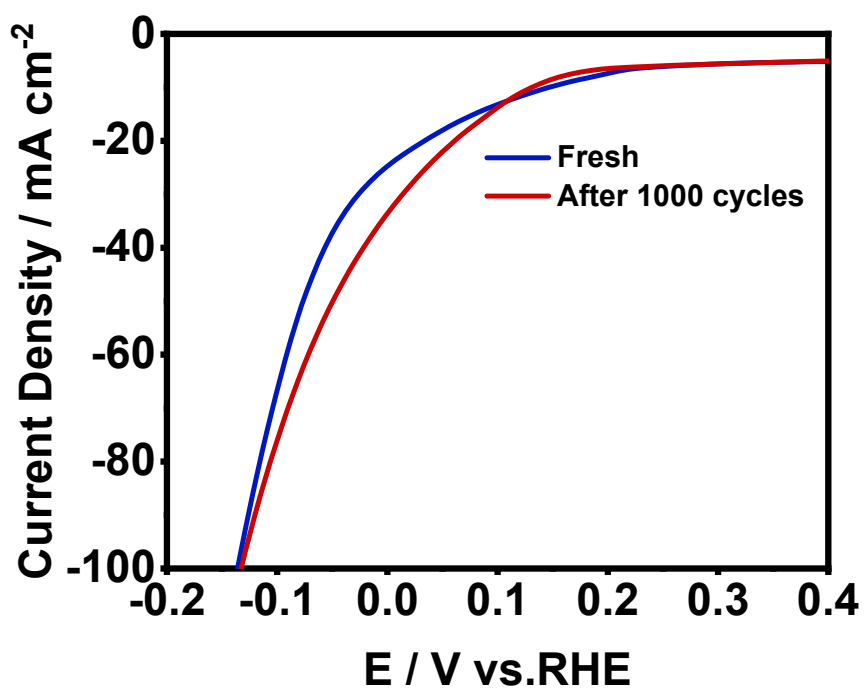


Fig. S13 Long-term stability measurement of the CoFe<sub>1/3</sub>V-LDH for over 24 h.





**Fig. S14** The linear scanning voltammograms of Pt@CoFe<sub>1/6</sub>V-LDH before and after 1000 CVs for HER.



**Fig. S15** The linear scanning voltammograms of Pt@CoFe<sub>1/3</sub>V-LDH before and after 1000 CVs for HER.

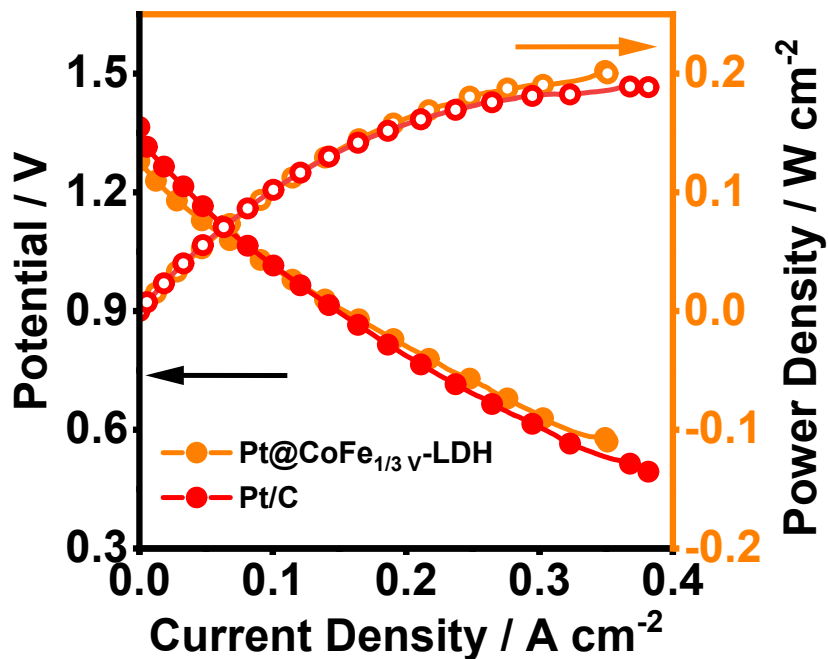


Fig. S16 Discharge profile and power density of liquid ZAB with the Pt@CoFe<sub>1/3</sub>V-LDH and commercial Pt/C as the air electrode catalyst.

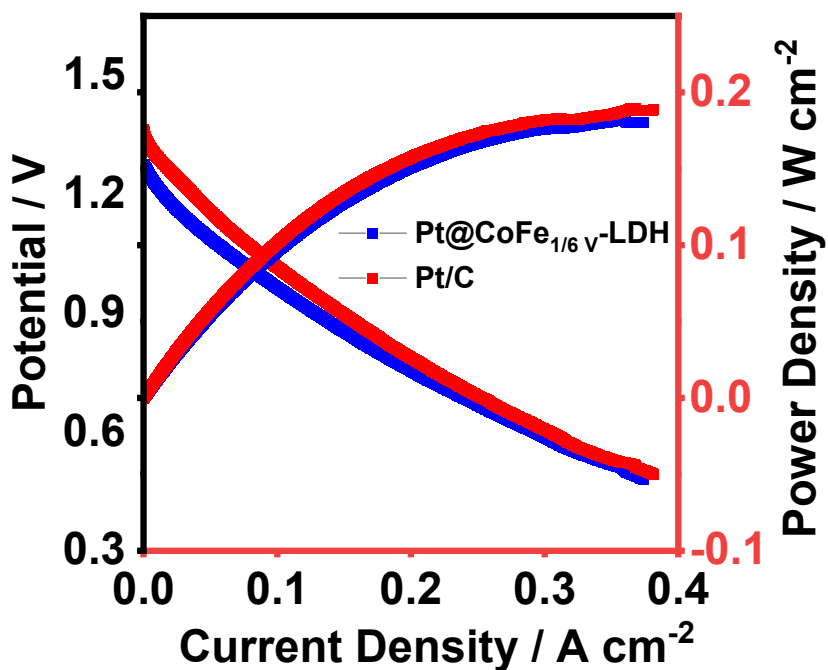


Fig. S17 Discharge profile and power density of liquid ZAB with the Pt@CoFe<sub>1/6</sub>V-LDH and commercial Pt/C as the air electrode catalyst.