

**In-situ Synthesis of Binder-Free MoS<sub>2</sub>/FeOOH@CC Heterostructure as  
Photoelectrode for High-Performance Photo-Rechargeable Zinc-Ion  
Batteries**

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## SUPPORTING INFORMATION

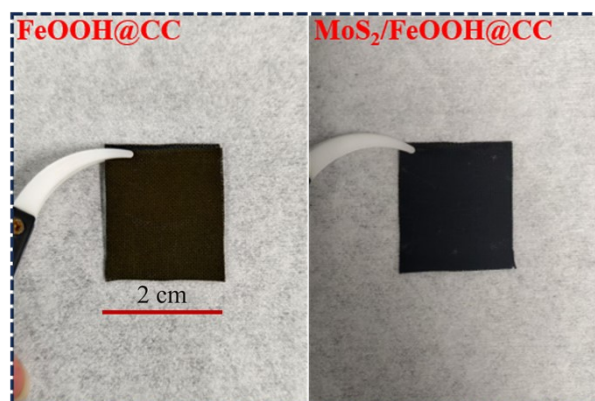


Figure S1. Digital graphs of FeOOH@CC and MoS<sub>2</sub>/FeOOH@CC.

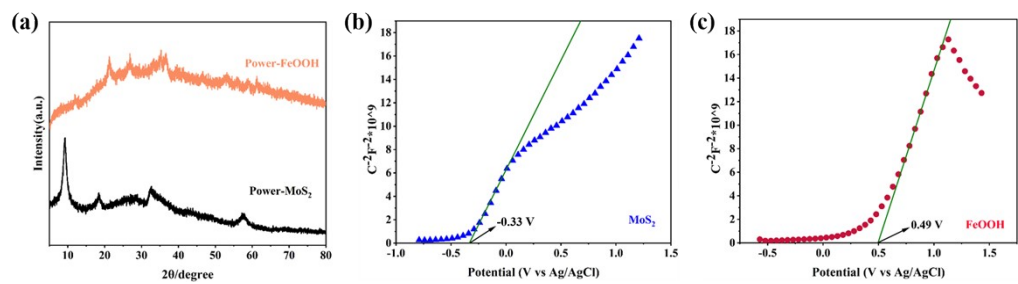


Figure S2. (a) XRD patterns of power MoS<sub>2</sub> and FeOOH; (b,c) Mott-Schottky diagram of MoS<sub>2</sub> and FeOOH.

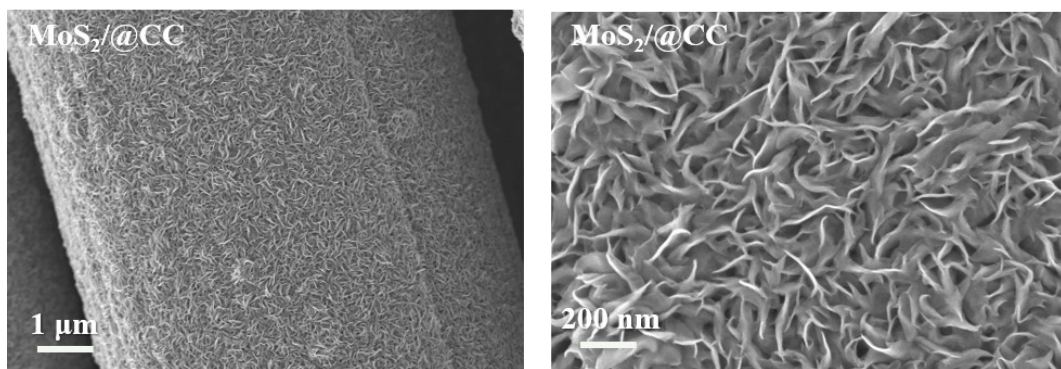


Figure S3. SEM image of MoS<sub>2</sub>@CC.

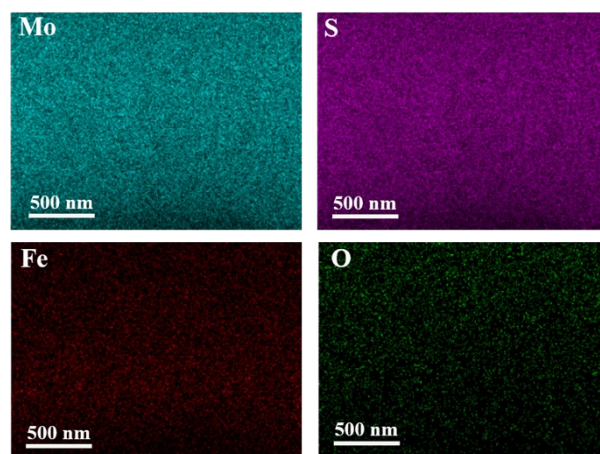


Figure S4. EDS mapping images of MoS<sub>2</sub>/FeOOH@CC section.

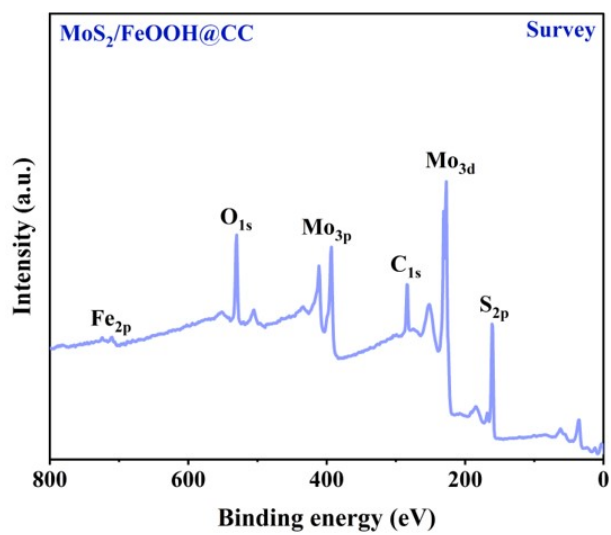


Figure S5. Full XPS spectra of MoS<sub>2</sub>/FeOOH@CC.

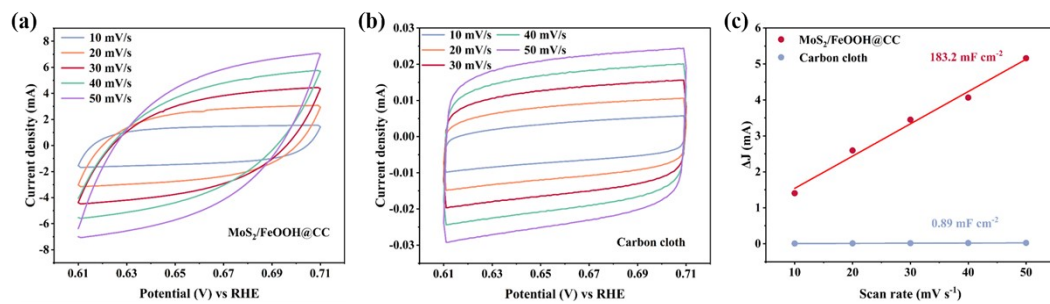


Figure S6. CV plots of (a) MoS<sub>2</sub>/FeOOH@CC and (b) CC collected at different scanning rates in 1 M Na<sub>2</sub>SO<sub>4</sub>; (c) Relations of the current density and the scanning.

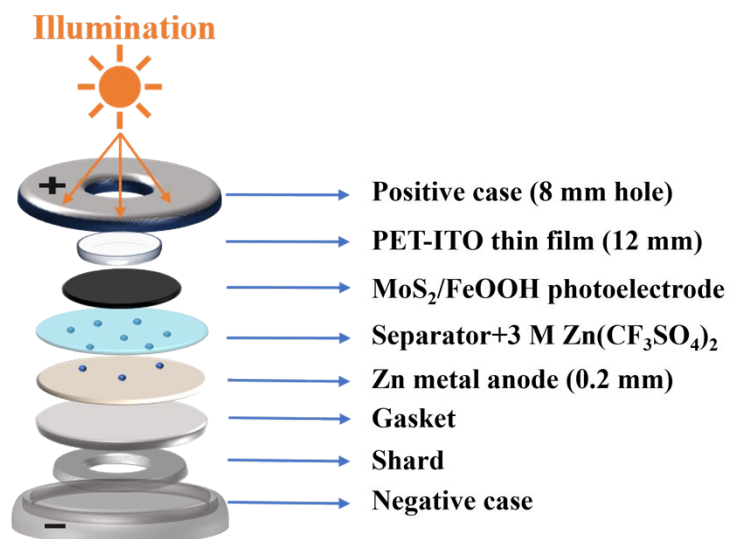


Figure S7. The structural diagram of PRZIB.

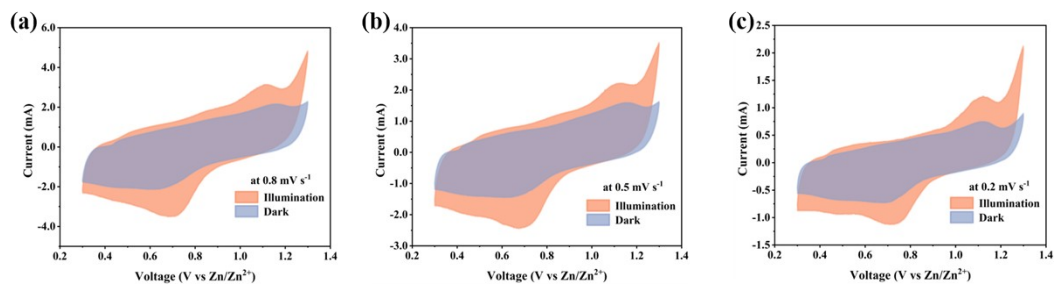


Figure S8. CV curves of MoS<sub>2</sub>/FeOOH@CC PRZIBs recorded at 0.8 mV s<sup>-1</sup>, 0.5 mV s<sup>-1</sup>, 0.2 mV s<sup>-1</sup> under dark and illuminated conditions.

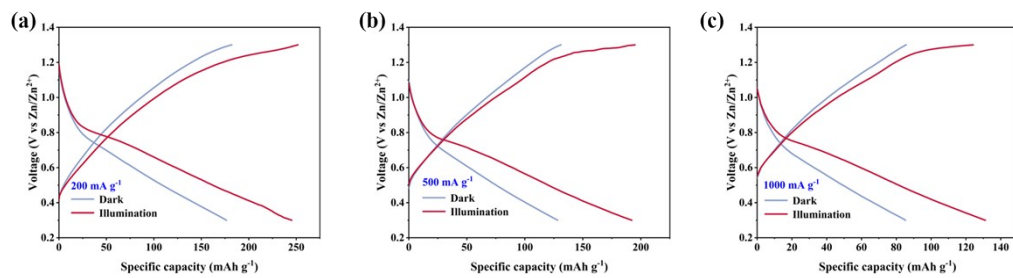


Figure S9. GCD profiles of MoS<sub>2</sub>/FeOOH@CC PRZIBs obtained at current densities of (a) 200 mA g<sup>-1</sup>, (b) 500 mA g<sup>-1</sup> and (c) 1000 mA g<sup>-1</sup> under dark and illuminated conditions.

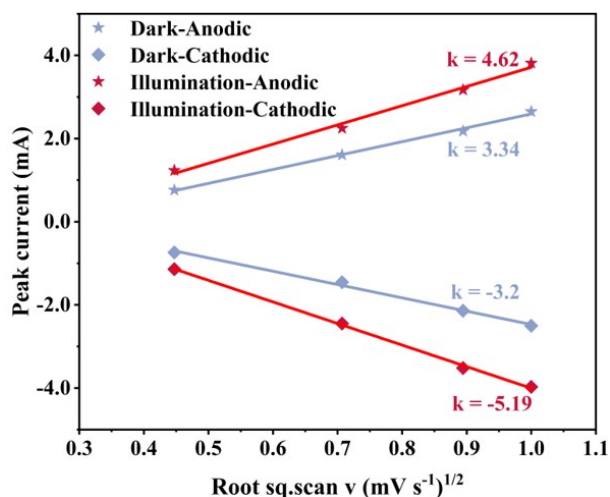


Figure S10. Linear relations of anodic peak currents ( $i_p$ ) versus the square roots of scanning rate.

Note: The  $\text{Zn}^{2+}$  diffusion coefficient ( $D$ ) is extracted by the Randles–Sevcik equation<sup>[6]</sup>

$$i_p = 2.69 \times 10^5 \times n^{3/2} \times A \times D^{1/2} \times C \times v^{1/2} \quad (\text{eq.S1})$$

where  $i_p$  refers to the peak current,  $n$  is the number of electrons in the reaction,  $A$  is the electrode area,  $C$  is the concentration of  $\text{Zn}^{2+}$  in the electrolyte, and  $v$  is the scanning rate.

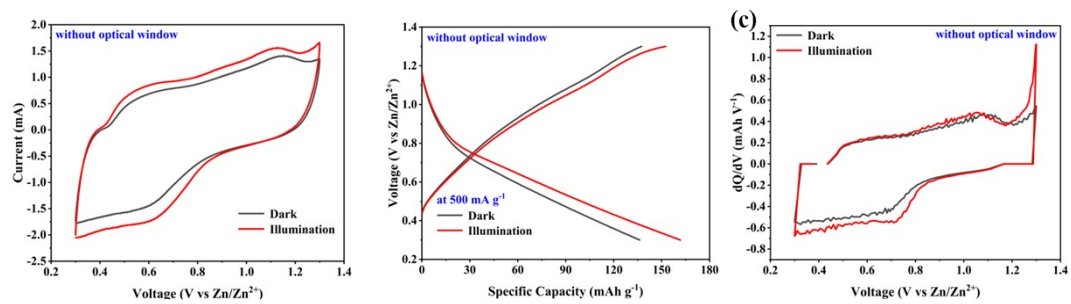


Figure S11. Comparison of a battery without optical window in alternating dark and light states (a) GCD curve (b) GCD curve at 500 mA h g<sup>-1</sup> current density (c) dQ/dV curve.

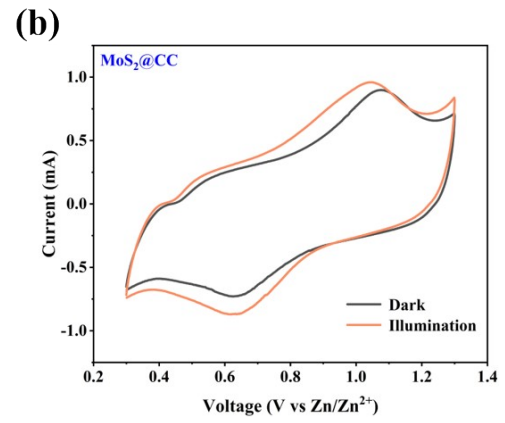
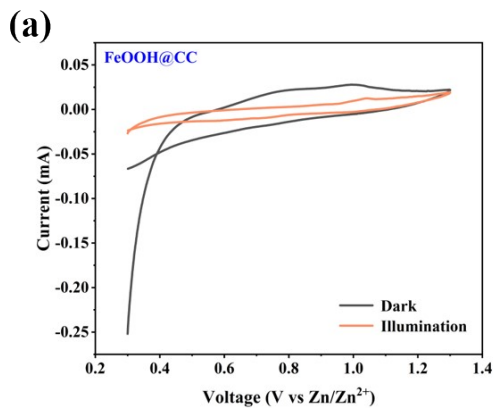


Figure S12. CV curves comparison under Illumination and dark (a) FeOOH@CC (b) MoS<sub>2</sub>@CC.