

**Point-to-face Z-scheme junction Cd<sub>0.6</sub>Zn<sub>0.4</sub>S/g-C<sub>3</sub>N<sub>4</sub> with a robust internal electric field for high-efficiency H<sub>2</sub>O<sub>2</sub> production**

Wenying Yu, Zijian Zhu, Cheng Hu, Sen Lin, Yinghui Wang, Chunyang Wang, Na Tian\*, Yihe Zhang, Hongwei Huang\*

Engineering Research Center of Ministry of Education for Geological Carbon Storage and Low Carbon Utilization of Resources, Beijing Key Laboratory of Materials Utilization of Nonmetallic Minerals and Solid Wastes, National Laboratory of Mineral Materials, School of Materials Science and Technology, China University of Geosciences (Beijing), Beijing 100083, China

\*Corresponding author: [tianna65@cugb.edu.cn](mailto:tianna65@cugb.edu.cn) (N. Tian); [hhw@cugb.edu.cn](mailto:hhw@cugb.edu.cn) (H.W. Huang)

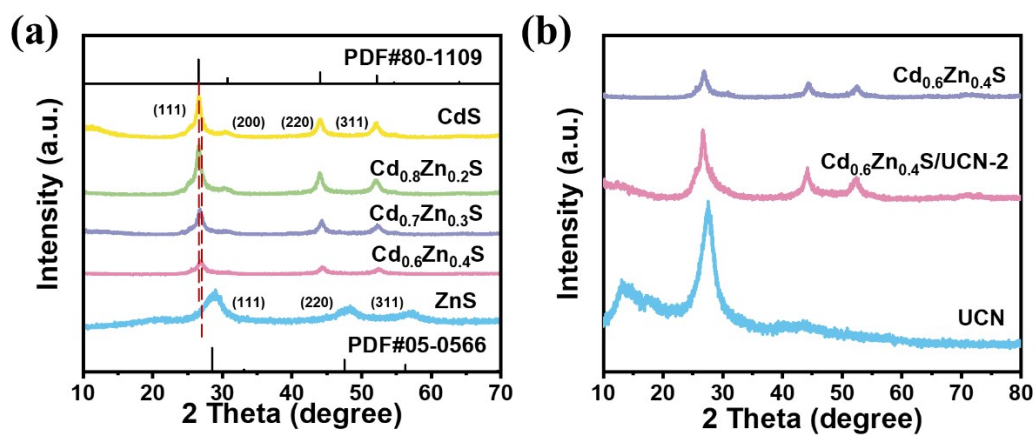


Figure S1. XRD patterns of (a) Cd<sub>x</sub>Zn<sub>1-x</sub>S and (b) Cd<sub>0.6</sub>Zn<sub>0.4</sub>S, UCN and Cd<sub>0.6</sub>Zn<sub>0.4</sub>S/UCN-2.

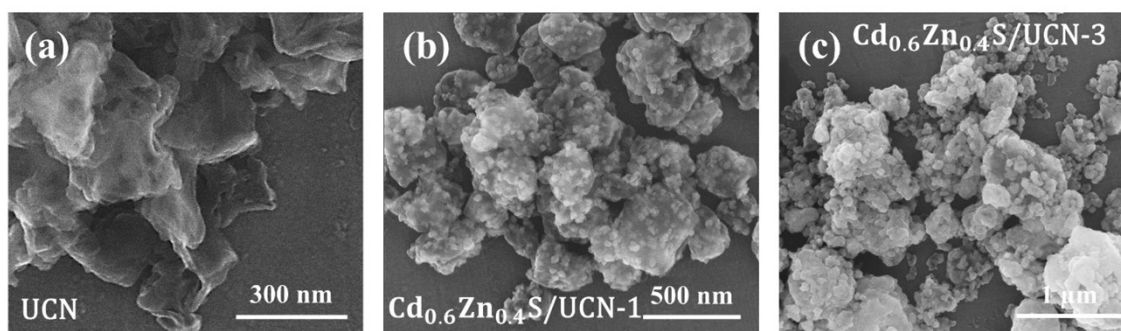


Figure S2. SEM images of (a) UCN, (b) Cd<sub>0.6</sub>Zn<sub>0.4</sub>S/UCN-1, and (c) Cd<sub>0.6</sub>Zn<sub>0.4</sub>S/UCN-3.

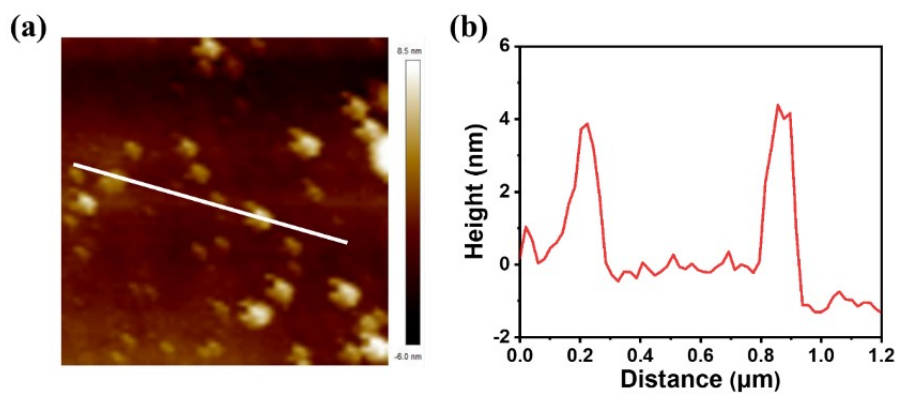


Figure S3. (a) AFM images and (b) the corresponding height curve of UCN.

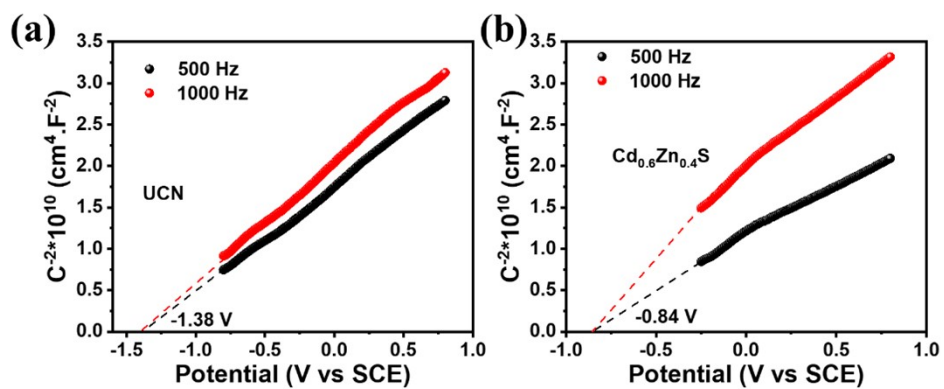


Figure S4. Mott-Schottky plots of (a) UCN and (b)  $\text{Cd}_{0.6}\text{Zn}_{0.4}\text{S}$ .

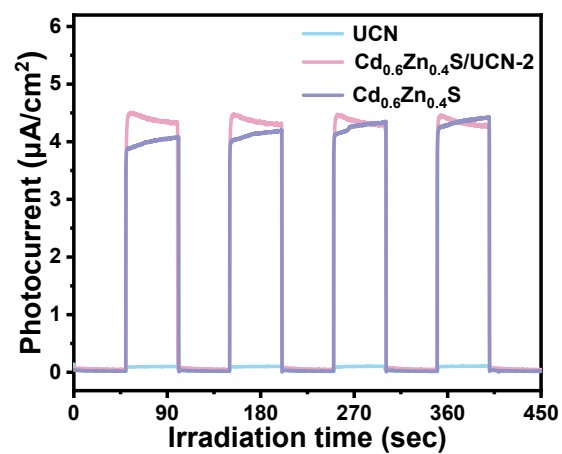


Figure S5. Transient photocurrent responses of UCN,  $\text{Cd}_{0.6}\text{Zn}_{0.4}\text{S}/\text{UCN-2}$  composite and  $\text{Cd}_{0.6}\text{Zn}_{0.4}\text{S}$ .

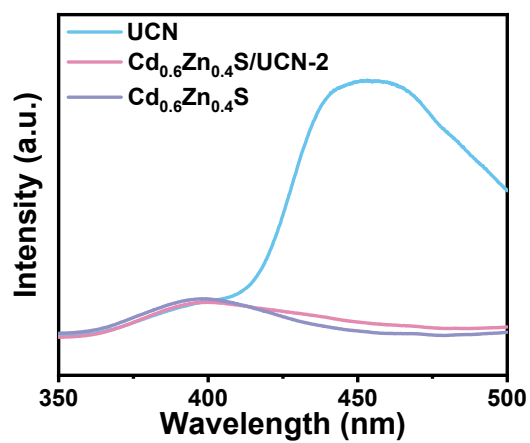


Figure S6. PL spectra over UCN,  $\text{Cd}_{0.6}\text{Zn}_{0.4}\text{S}/\text{UCN-2}$  composite and  $\text{Cd}_{0.6}\text{Zn}_{0.4}\text{S}$ .

**Table S1.** TR-PL date of the samples

<b>Samples</b>	$\tau_1/\text{ns}$	$\tau_2/\text{ns}$	$\tau_1/\text{ns} (A_1)$	$\tau_2/\text{ns} (A_2)$	$\tau_{\text{Ave}}/\text{ns}$ a	<b>R<sup>2</sup></b>
<b>UCN</b>	2.60	14.48	1827.52	330.53	8.56	0.9963
<b>Cd<sub>0.6</sub>Zn<sub>0.4</sub>S/UCN-2</b>	1.79	9.38	1576.86	421.92	6.22	0.9972
<b>Cd<sub>0.6</sub>Zn<sub>0.4</sub>S</b>	1.68	12.80	1691.27	315.49	8.21	0.9946

<sup>a</sup>The calculation formula of the average TR-PL lifetime is  $\tau_{\text{Ave}}$ :

$$(A_1 * \tau_1 * \tau_1) + (A_2 * \tau_2 * \tau_2) / (A_1 * \tau_1 + A_2 * \tau_2)$$