# Efficient photocatalytic hydrogen evolution coupled with benzaldehyde production over 0D $Cd_{0.5}Zn_{0.5}S$/2D $Ti_3C_2$ Schottky heterojunction

Junnan Tao[1#], Mingyuan Wang[2#], Guiwu Liu[1]*, Qinqin Liu [1], Lei Lu[1], Neng WAN[2], Hua Tang[3]*, Guanjun Qiao[1]

[1]*School of Materials Science and Engineering, Jiangsu University, Zhenjiang, Jiangsu, 212013, P. R. China*

[2]*SEU-FEI Nano-Pico Center, Key Laboratory of MEMS of Ministry of Education, School of Electrical Science and Engineering, Southeast University, Nanjing,*

*3 School of Environmental Science and Engineering, Qingdao University, Qingdao 266071, China*

*210096, China*

Corresponding author: gwliu76@mail.ujs.edu.cn (G. W. Liu); huatang79@163.com (H.Tang)

[#]These authors contributed equally to this work

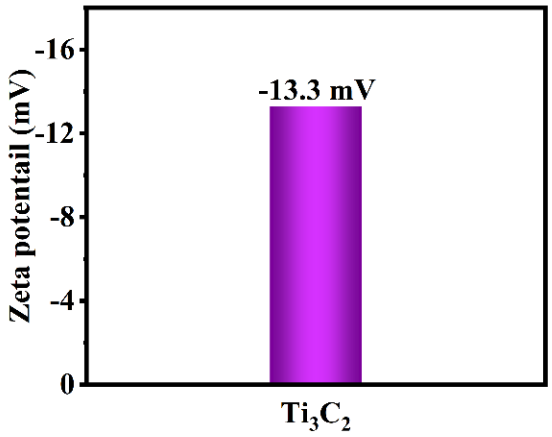


**Fig. S1** Zeta potential of $Ti_3C_2$ nanosheets.

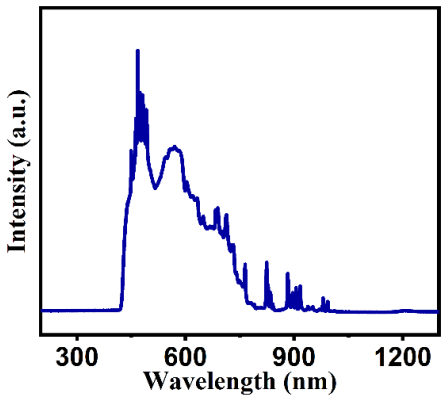


**Fig. S2** The irradiance spectrum of 300 W Xe light source with UV cutoff filter.

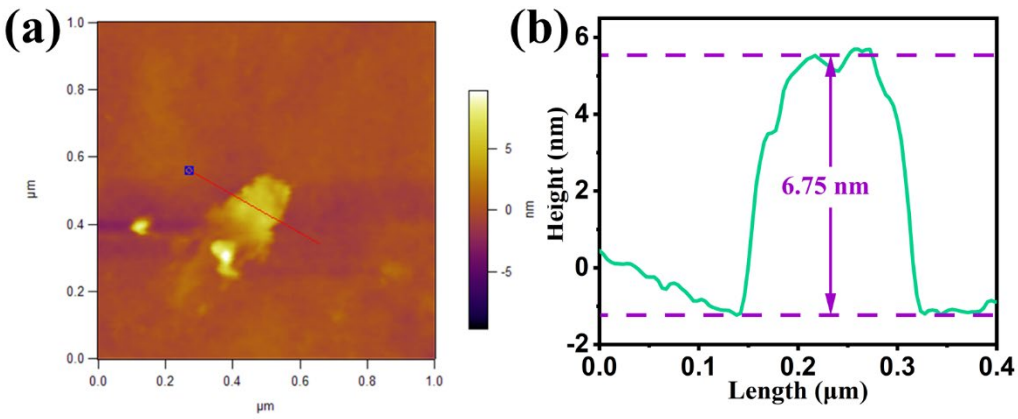


**Fig. S3** (a) AFM image of $Ti_3C_2$ nanosheet and (b) its thickness.

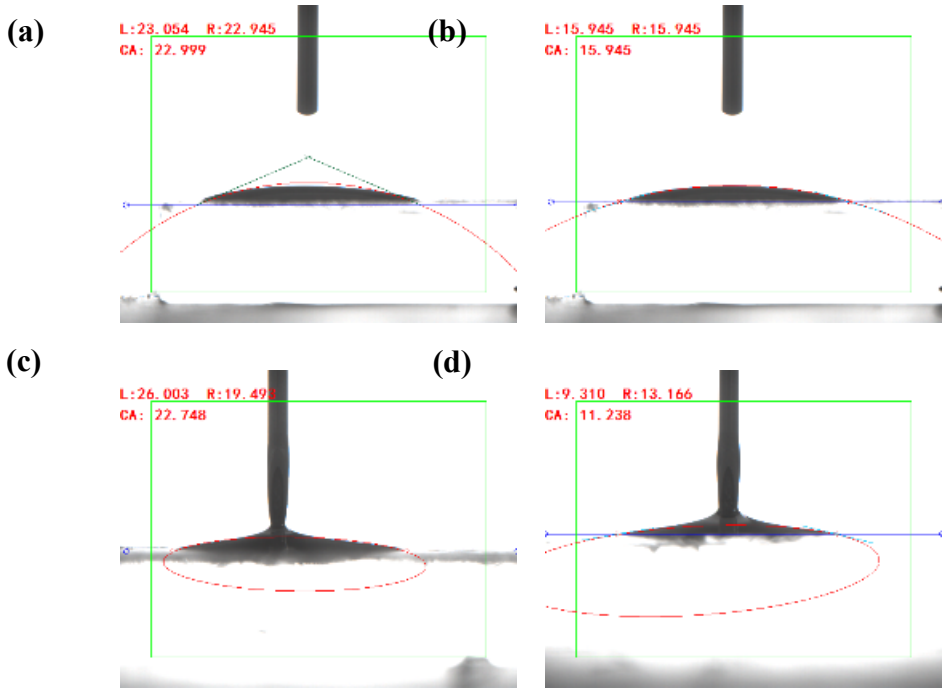


**Fig. S4** Contact angles of (a,b) deionized water and (c,d) benzyl alcohol on the (a,c) Cd0.5Zn0.5S and (b,d) CZS-3MX coating samples.

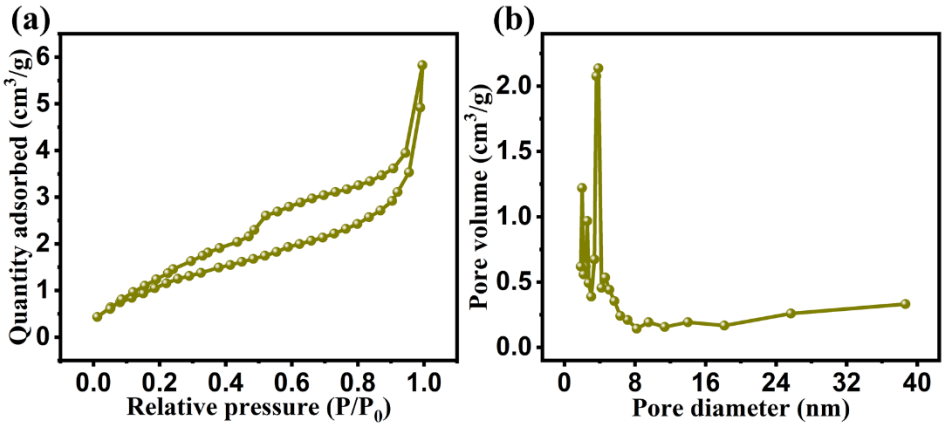


**Fig. S5** Nitrogen adsorption-desorption isotherms and pore size distribution of $Ti_3C_2$ nanosheets.

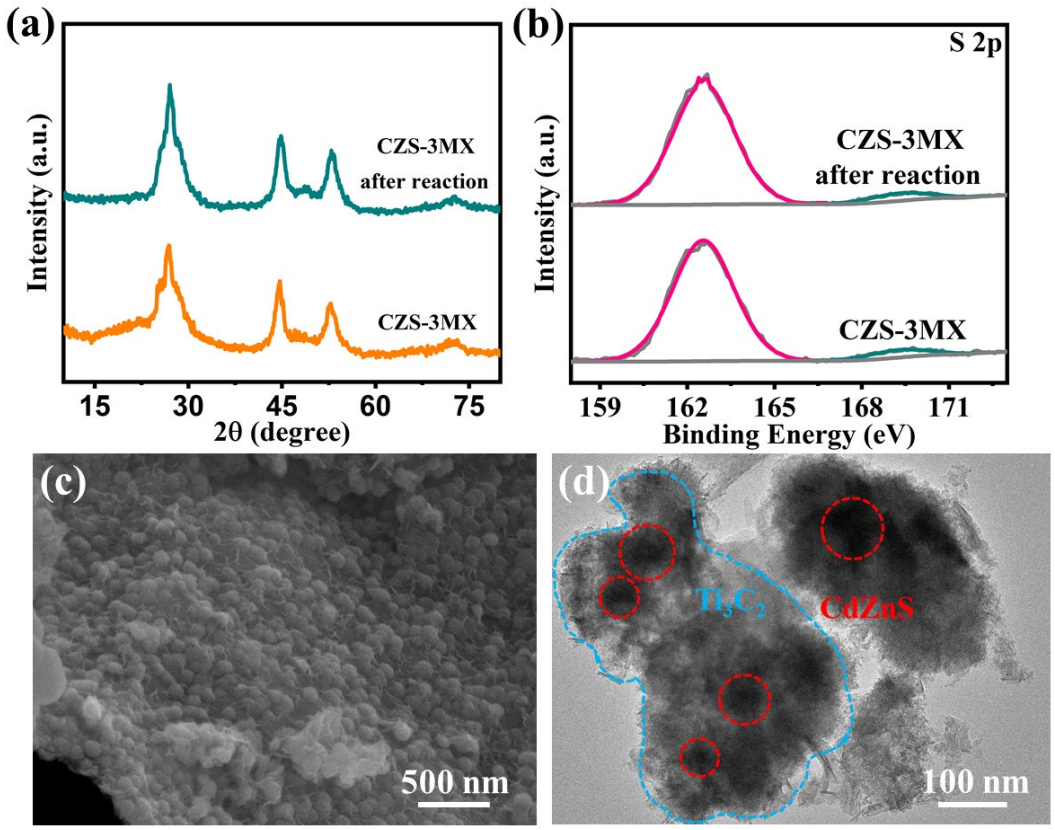


Fig. S6 (a) XRD patterns and (b) S 2p spectra of CZS-3MX hybrid before and after cycle test. (c) SEM and (d) TEM images of CZS-3MX hybrid after cycle test.

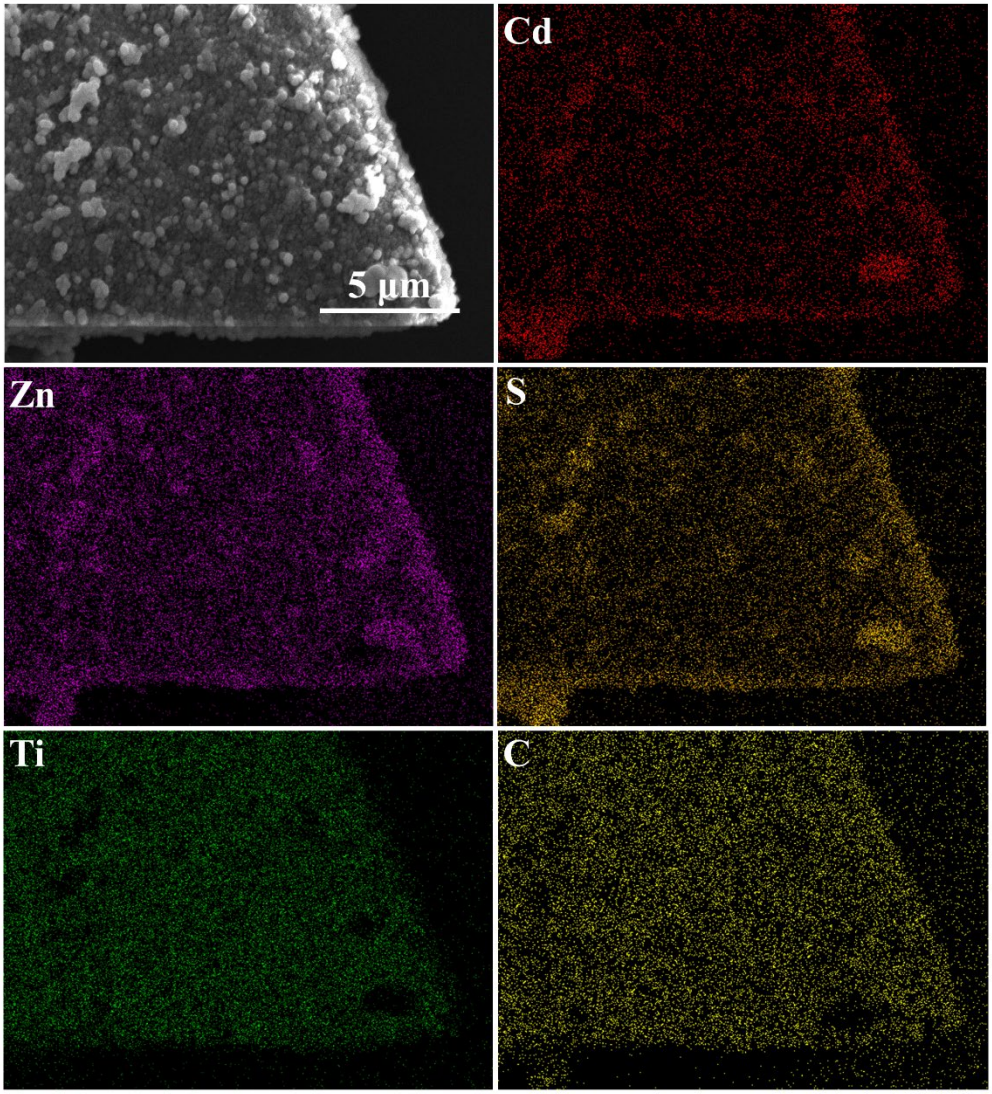


Fig. S7 SEM image and the corresponding EDS mappings of CZS-3MX hybrid after cycle test.