

Stable and efficient Ni-Mo catalyzed TiO<sub>2</sub>/CdS/CIGS photocathode for solar water splitting  
under various pH conditions

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We catalyze the CIGS photocathode with Ni-Mo as a non-noble metal catalyst to enhance the PEC efficiency, and also we employ atomically grown TiO<sub>2</sub> in passivating to passivate the CdS/CIGS surface to improve the stability in under a wide range of pH conditions. Our Ni-Mo alloy exhibits the best HER catalytic activities activity among reported HER catalysts in both acidic and alkaline solutions. The Ni-Mo/CdS/CIGS photocathode yields an open-circuit photovoltage of 0.5 V and a short circuit photocurrent density as high as 15 ~ 25 mA cm<sup>-2</sup> in various pH conditions ranging from 0.4 to 14, which is highly comparable to that of Pt/CdS/CIGS. Furthermore, the passivation of CdS/CIGS with a thin TiO<sub>2</sub> ALD layer effectively prevents the photocorrosion of CdS photocorrosion and also the dissolution of the Mo back contact's dissolution, which are the main causes of photocathode's degradation the degradation of the photocathode. The optimized Ni-Mo/TiO<sub>2</sub>/CdS/CIGS photocathode produces a stable photocurrent density at 0 VRHE .