Enhanced visible light catalytic activity of MoS2/TiO2/Ti photocathode by hybrid-junction - DTU Orbit (18/10/2019)

Enhanced visible light catalytic activity of MoS2/TiO2/Ti photocathode by hybrid-junction

In photoelectrochemical (PEC) water splitting systems, crucial obstacles limiting their performance are poor charge carrier dynamics and high recombination rate of photoexcited electron hole pairs. Here, we report that this issue can be alleviated by engineering a hybrid-junction that is composed of homo- and hetero- junctions. This strategy is performed by facile hand-spraying MoS2 over the surface of an anatase/rutile homo-junction TiO2 film on the Ti substrate to further form a hybrid-junction photocathode. By applying this photocathode into PEC reactor, enhanced catalytic activity is achieved under visible light (AM1.5 illumination of 300W/m²) with hydrogen evolution reaction (HER) potential of −114mV versus reversible hydrogen electrode (RHE) at 10mA/cm² and long-term stability of more than 10 times improvement comparing to ordinary electrode without the introduciton of hybrid-junction. The hybrid-junction that effectively regulates charge separation and transfer pathways is proven to be responsible for the enhanced activity. As an novel exploration, this hybrid-junction system comprising of low-cost, efficient charge separation and transfer, and visible light responsivity offers a new path for relative materials to boost their PEC performance.

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