Photoelectrochemical solar water oxidation using CuInS2/CdS/ZnO heterostructure nanorod array photoanode

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P-type Cu(In,Ga)(Se,S)2(CIGS) chalcogenide materials have high absorption coefficients, tunable band gap energies(1.0-1.7 eV), so they are well known materials for photo-absorber in thin film solar cell. we use them as photoanodes with n-type CdS/ZnO nanorod arrays to make p-n junction in the photoanode. This p-n junction makes efficient charge seperation and improve photoelectrochemical performance of cell.

For efficient light harvesting and photoexcited charge collection, ZnO nanorod arrays were grown and co-sensitized with CdS and CuInS2(CIS). A CdS layer was deposited on the ZnO NW via successive ion layer adsorption and reaction (SILAR), and the CIS layer was prepared by depositing a molecular precursor solution onto the CdS/ZnO NW. By perfoming XRD and EELS, we confirmed CIS, CdS, ZnO are well deposited. In optical absorption spectra, ZnO nanorod arrays can only absorb light below 400nm, but with CIS/CdS, they can absorb light up to 800nm. Our heterostructure photoelectrode has generated a greatly improved photocurrent density of 13.8mA/cm 2 at 0.3V vs. SCE under 1 sun illumination.