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ABSTRACT

Copper sulfide (CuS) thin films with a nanoparticle structure on a fluorine-doped tin oxide (FTO) substrate prepared by facile chemical bath deposition (CBD) at different growth times were used as the CE for QDSSCs. The morphology of the CuS CE was controlled well by the electrochemical growth time. Here, the CuS thin films deposited for 2 h (CuS2h) CE and TiO_2/CdS/CdSe/ZnS QD sensitized cell exhibited superior electrochemical and photovoltaic performance with J_{sc}, V_{oc}, and FF values of 15.52 mA cm^{-2}, 0.612 V, and 0.452, respectively, and an efficiency (η) of 4.29%, whereas the cell with the Au CE delivered an η of only 2.19% under the same conditions. Electrochemical impedance spectroscopy and Tafel polarization showed that the CuS film deposited at 2 h possesses fascinating electrocatalytic activity for the S^{2-}/S_n^{2-} redox couple in a polysulfide electrolyte solution that was superior to Au CE. In addition, the stability test conducted for both CuS and Au-based devices for approximately 45 hours under