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(R1) Platinum-decorated Cu(InGa)Se_2/CdS photocathodes: Optimization of Pt electrodeposition time and pH level

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Abstract

Photoelectrochemical (PEC) water splitting was performed using co-evaporated Cu(In,Ga)Se_2 (CIGS, p-type) films as the photocathode. Pt was electrodeposited on CIGS and CIGS/CdS films. The effect of the electrodeposition time was investigated to determine the optimal deposition conditions. The CIGS film was covered with a 60-nm-thick CdS layer (n-type) using a chemical-bath deposition technique, which created a p-n junction. The effect of the Pt electroplating time was again investigated for the CIGS/CdS films; thus, the effect of CdS addition could be quantitatively investigated. The effect of the pH of 0.5 M Na_2SO_4 electrolyte was also investigated. The optimal water-splitting performance occurred at −24.16 mA/cm^2 at –0.7 V vs. Ag/AgCl with a Pt electrodeposition time of 20 min and pH 9. The CIGS/CdS films were characterized by X-ray diffraction, scanning electron microscopy, and focused-ion beam transmission electron microscopy.

Keywords: CIGS/CdS, photocurrent, platinum, p-n junction, water splitting.

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†Equal contribution