

## Supplementary Materials

# **Noble Metal Modification of CdS-Covered CuInS<sub>2</sub> Electrodes for Improved Photoelectrochemical Activity and Stability**

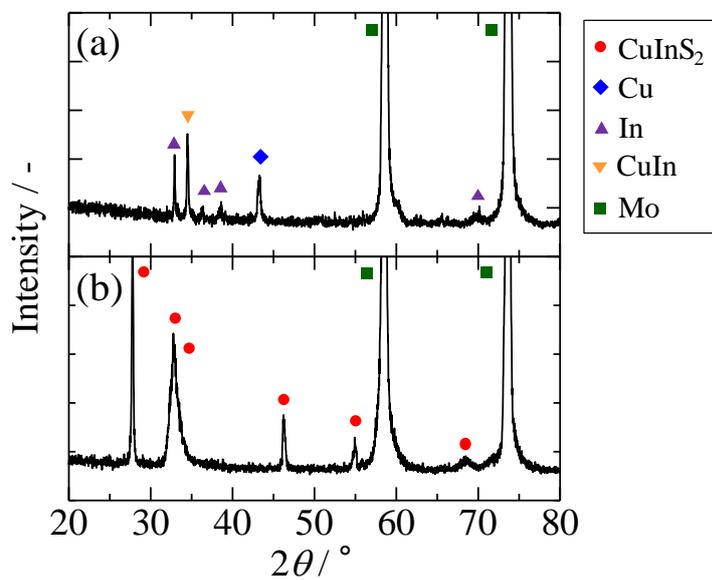
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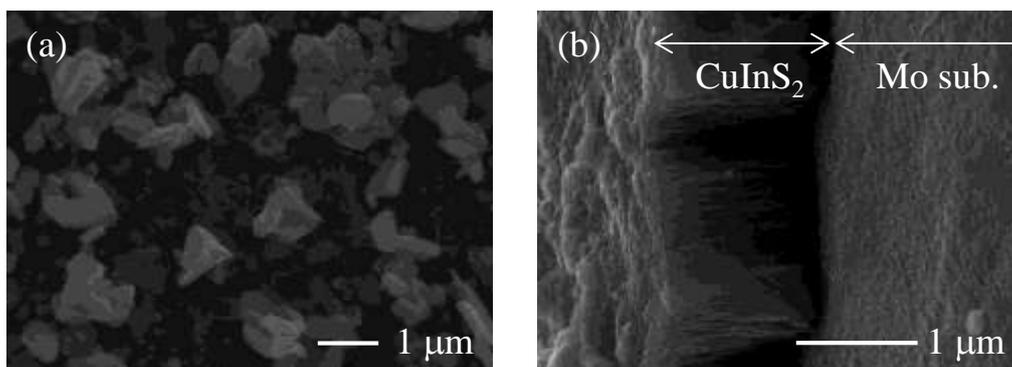
1. XRD pattern of CuInS<sub>2</sub> electrode before and after sulfurization
2. SEM images of CuInS<sub>2</sub> film
3. SEM image of electrodeposition Pt nanoparticles
4. Effect of CdS and Pt deposition on photo response of CuInS<sub>2</sub> electrode
5. Band characteristics of the synthesized CdS film
6. Comparison of polarization curves of Pt/CdS/CuInS<sub>2</sub> electrodes
7. Change in XPS spectra between before and after photoelectrochemical CO<sub>2</sub> reduction
8. SEM images of Au/CdS/CuInS<sub>2</sub> and Ag/CdS/CuInS<sub>2</sub> electrodes

## 1. XRD pattern of CuInS<sub>2</sub> electrode



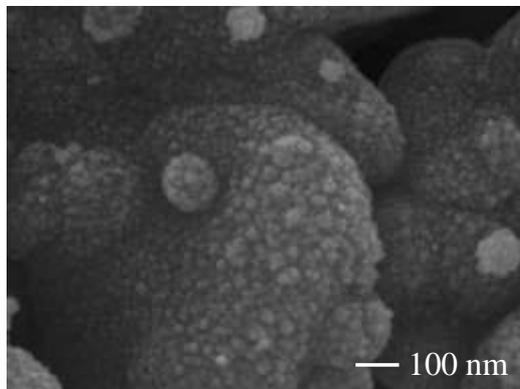
**Figure S1.** XRD patterns of CuInS<sub>2</sub> electrode measured (a) before and (b) after sulfurization.

## 2. SEM images of CuInS<sub>2</sub> film



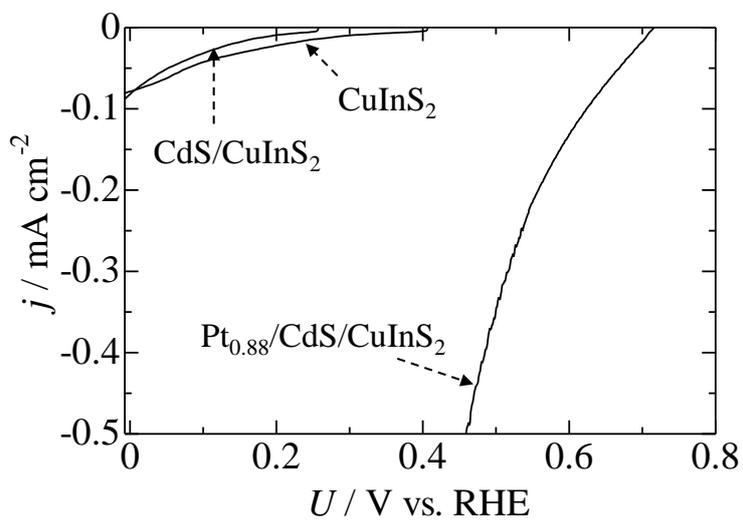
**Figure S2.** (a) Top-down and (b) cross-sectional views of CuInS<sub>2</sub> film.

### 3. SEM image of electrodeposition Pt nanoparticles



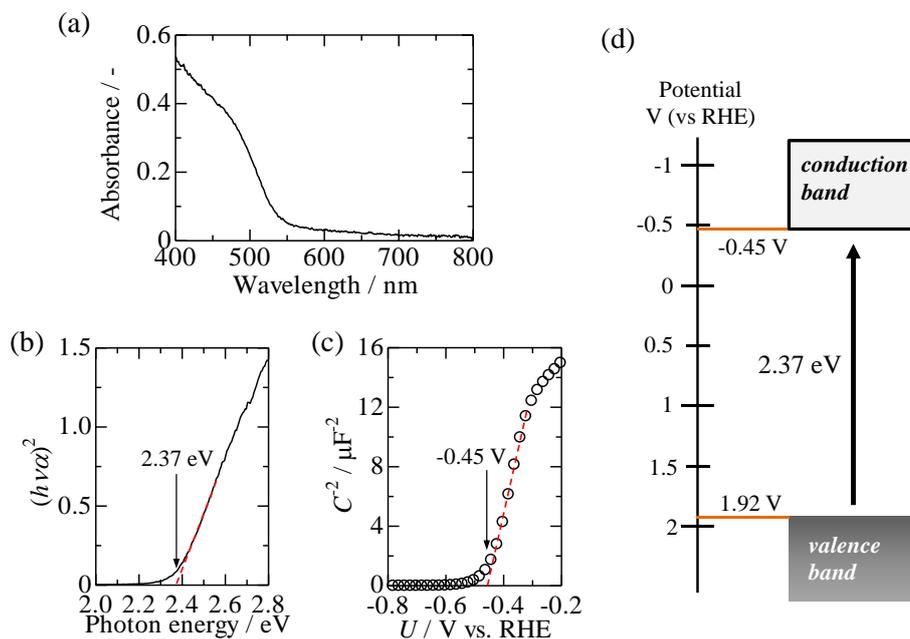
**Figure S3.** A magnified SEM image of Pt<sub>0.88</sub>/CdS/CuInS<sub>2</sub> electrode.

### 4. Effect of CdS and Pt deposition on photo response of CuInS<sub>2</sub> electrode



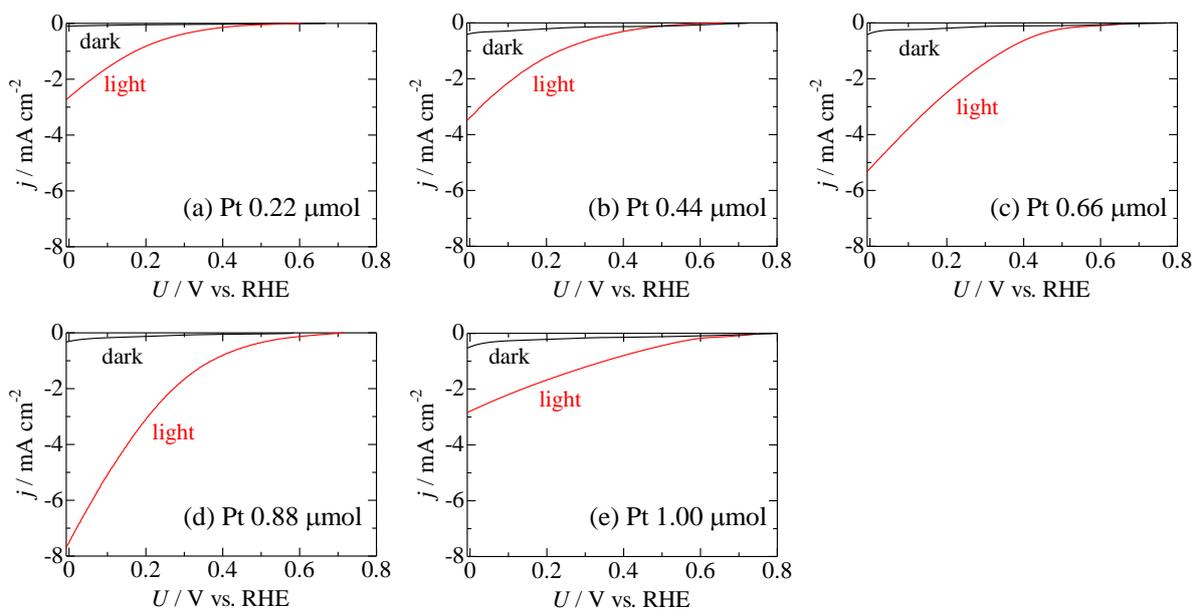
**Figure S4.** Polarization curves of CuInS<sub>2</sub>, CdS/CuInS<sub>2</sub>, and Pt<sub>0.88</sub>/CdS/CuInS<sub>2</sub> electrodes measured under irradiation of visible light ( $\lambda > 420$  nm).

## 5. Band characteristics of the synthesized CdS film



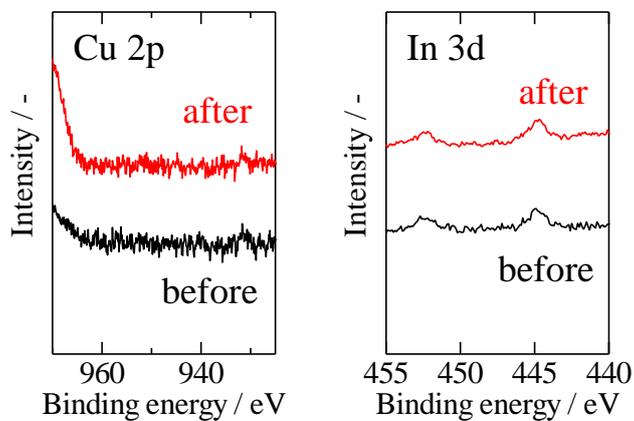
**Figure S5.** (a) UV-vis absorption spectrum, (b) Tauc plot, and (c) Mott–Schottky plot of CdS film. (d) Band alignment of the synthesized CdS film deduced from the results shown in (a)–(c).

## 6. Comparison of polarization curves of Pt/CdS/CuInS<sub>2</sub> electrodes



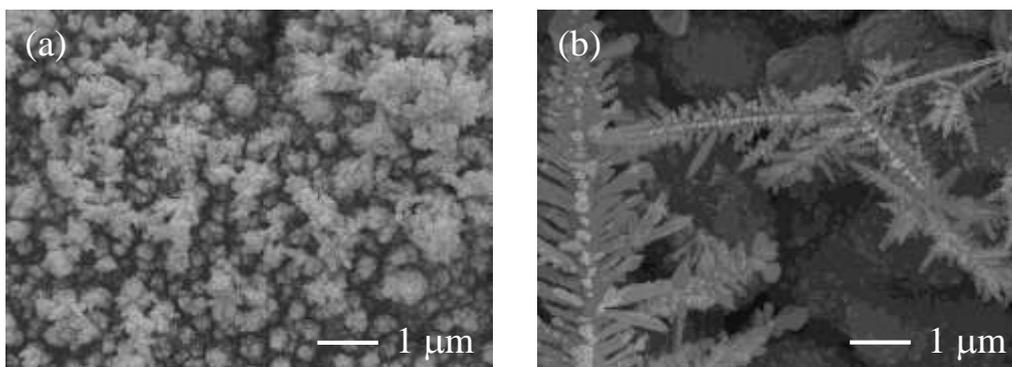
**Figure S6.** Polarization curves of (a) Pt<sub>0.22</sub>/CdS/CuInS<sub>2</sub>, (b) Pt<sub>0.44</sub>/CdS/CuInS<sub>2</sub>, (c) Pt<sub>0.66</sub>/CdS/CuInS<sub>2</sub>, (d) Pt<sub>0.88</sub>/CdS/CuInS<sub>2</sub>, and (e) Pt<sub>1.00</sub>/CdS/CuInS<sub>2</sub> electrodes.

7. Change in XPS spectra between before and after photoelectrochemical CO<sub>2</sub> reduction



**Figure S7.** XPS spectra of Pt<sub>0.88</sub>/CdS/CuInS<sub>2</sub> electrode measured before and after 120 min of photoelectrochemical CO<sub>2</sub> reduction experiment.

8. SEM images of Au/CdS/CuInS<sub>2</sub> and Ag/CdS/CuInS<sub>2</sub> electrodes



**Figure S8.** SEM images of (a) Au/CdS/CuInS<sub>2</sub> and (b) Ag/CdS/CuInS<sub>2</sub> electrodes.