

## Photocatalytic Water Reduction on Multijunction Copper Indium Sulfide

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Photoelectrochemical(PEC) water splitting system has been considered as promising alternative energy source like hydrogen. There are several requirements for the development of the material, able to convert water to hydrogen with the light such as narrow band gap which utilize large portion of sun light. 2) appropriate band alignment for hydrogen reduction. 3) earth abundant and low cost of fabrication and 4) electrical and chemical stability in aqueous solution for commercial usage.

Copper Indium Sulfide(CIS) can be synthesized from Copper oxide. At first, fabricate Copper oxide thin film on FTO substrate. Then exchange the oxide to indium sulfide by solvothermal treatment. CIS has 1.5eV of band gap. It is proper to use visible light that contains 60% of energy of sunlight and to fabricate multijunction PEC cell.

But CIS has poor charge transfer activity, slow kinetics and it is unstable. To overcome disadvantages of CIS, 1) optimize the synthesis method of CIS, 2) make the tandem structure with n-type semiconductors increase the usable range of sunlight. Especially, Cadmium sulfide make the charge transfer rate faster and Titanium oxide increases the stability.