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Preperation of CuInSe₂ Nanoparticles by Solution Process Using Precyrors

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I - III - VI₂ chalcopyrite compounds, particularly copper, indium, gallium selenide(Cu(In_xGa_{1-x})Se₂, CIGS), are effective light-absorbing materials in thin-film solar application. They are direct band-gap semiconductors with correspondingly high optical absorption coefficients. Also they are stable under long-term excitation. CIS (CIGS) solar cell reached conversion efficiencies as high as 19.5%. Several methods to prepare CIS (CIGS) absorber films have been reported, such as co-evaporation, sputtering, selenization, and electrodeposition. Until now, co-evaporation is the most successful technique for the preparation of CIS (CIGS) in terms of solar efficiency, but it seems difficult to scale up. CIS solar cells have been hindered by high costs associated with a fabrication process. Therefore, inorganic colloidal ink suitable for a scalable coating process could be a key step in the development of low-cost solar cells. Here, we will present the preparation of CIS photo absorption layer by a solution process using novel metal precursors. Chalcopyrite copper indium diselenide (CuInSe₂) nanocrystals ranging from 5 to 20nm in diameter were synthesized by arrested precipitation in solution. For the fabrication of CIS photo absorption layer, the CuInSe₂ colloidal ink was prepared by dispersing in organic solvent and used to drop-casting on molybdenum substrate. We have characterized the nanoparticleless and CIS layer by XRD, SEM, TEM, and ICP.

Keywords: CuInSe₂, Nanoparticles, Chalcophyrite, Photovoltaic, Thin film solar cell