

Fabrication of a transparent glass based CuInGaS₂ thin film solar cell by a solution process

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We present the fabrication of wide band-gap CuInGaS₂ (CIGS) thin film solar cells based on precursor solutions (Cu, In, and Ga nitrates in alcohol) on transparent indium tin oxide (ITO) substrate. The CIGS absorber film was deposited by spin-coating method followed by two heat treatment processes. The first annealing process has done on hot plate at 300 °C for 30 min in air to remove carbon impurity in the polymer binder and the subsequence sulfurization process at 500 °C in H₂S (1 at%) to form a polycrystalline CIGS film. The absorber film with thickness of about 1.1 μm and a wide band-gap of about 1.52 eV was obtained. Electron probe microanalyzer (EPMA) was performed showing non-stoichiometric CIGS composition and Ga gradient with significant increase the Ga amount at the bottom closed to ITO contact. The bifacial CIGS thin film device performance showed the power conversion efficiency of over 6.6% which is the best performance so far for precursor solution processed CIGS thin film fabricated on transparent ITO substrate. The details of fabrication method and characteristics of the solar cells will be discussed in the presentation.