

Development of CZTS Based Solar Cell

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The two semiconductor layers $\text{Cu}_2\text{ZnSnS}_4$ (CZTS) and CdS were successfully fabricated using economical, solution-based fabrication techniques. CZTS thin film fabrication was done by spin coating technique onto soda-lime glass substrates at rotating speed of 2000 to 6000 rpm. It was found that the optimum precursor solution temperature is 38°C - 42°C . The films dried at 140°C - 160°C and annealed in air at 280°C have shown a band gap in the range of 1.45 to 1.55eV. Cadmium Sulfide (CdS), the n-type semiconductor heterojunction partner for CZTS was also deposited with good thickness control and uniformity in the range of 50-100nm range. Chemical bath deposition method was utilized for CdS thin film fabrication and the CdS thin film with optimum properties was obtained at the conditions of 40°C - 45°C temperature range and thickness variations were also apparent with the number of coatings applied and the fabrication time. The annealing temperature was found to be critical within the range of 180°C - 220°C (30 mins) for the optimization of CdS bandgap. CdS thin film fabricated under optimum conditions has shown a bandgap range of 2.30eV-2.50eV. Successful deposition on Fluorine doped Tin Oxide (FTO) glass substrate, reveals a feasible route to fabricate superstrate type photovoltaic cell.