Abstract Submitted
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Optimization of the $CuInSe_2$ Absorber for the Bottom Cell of a Polycrystalline Thin Film Tandem Solar Cell.[1] DHURBA RAJ SAPKOTA, PUJA PRADHAN, PRAKASH KOIRALA, BALAJI RAMANUJAM, COREY GRICE, RANDY J. ELLINGSON, RICHARD IRVING, MICHAEL J. HEBEN, ROBERT W. COLLINS, University of Toledo — Thin film $CuIn_{1-x}Ga_xSe_2$ (CIGS) is an important absorber material for single junction solar cells. CIGS with Ga content x ˜0.3, having a bandgap near 1.2 eV, is well known to provide the highest efficiencies. $CuInSe_2$ (x = 0) has recently attracted interest as a possible bottom cell absorber of a tandem solar cell due to its narrow bandgap of 1.0 eV and suitable p-type electronic properties. The CIGS materials yielding the highest efficiency solar cells are deposited by multisource evaporation which requires accurate calibration of Cu, In, and Ga atomic fluxes in the deposition process. In this research, a CIS calibration has been developed by utilizing real time spectroscopic ellipsometry analysis for thin film depositions of copper (Cu), copper selenide (Cu_2Se) and indium selenide (In_2Se_3) to determine the atomic fluxes at different Cu and In evaporation source temperatures. Using this calibration, CIS can be deposited at different rates while maintaining the desired p-type stoichiometry of [Cu]/[In] = 0.9. Guided by the calibration, optimization of $CuInSe_2$ solar cells has been demonstrated by incorporation of one-stage CIS absorbers fabricated over a range of deposition rates .

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