INVESTIGATING THE OPTICAL AND ELECTRICAL PROPERTIES OF Cu$_2$O AND ZnS:Al THIN FILMS FOR SOLAR CELL APPLICATIONS

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ABSTRACT

Thin film semiconductors have found applications in various devices like solar cells, photo detectors, integrated circuits (ICs), light emitting diodes (LED) among others. A lot of interest is on solar cell application of thin film semiconductors due to the rising need for low cost and renewable source of energy. Various elements and compounds have been used to fabricate thin film semiconductors for solar cell applications like Ge, Si, Al, GaAs, CuInSe₂ among others. Thin film semiconductors of Cu₂O, and aluminum doped ZnS are promising candidates for the development of future generation improved efficiency and low cost solar cells. This is due to their high absorption co-efficient and good optical properties in the visible region of the solar spectrum. However, very little data in literature is available on Cu₂O-ZnS:Al p-n junction. Therefore in this research, Cu₂O and ZnS:Al thin films will be deposited on glass substrate by dc magnetron sputtering and evaporation techniques, respectively using Edward Auto 306 evaporation system. Cu₂O-ZnS:Al p-n junction will be fabricated by evaporation method on a glass substrate. Optical properties of both Cu₂O and ZnS:Al thin films such as absorption coefficient, transmittance and reflectance will be investigated using Spectro Photometer 3700. The optical measurements will be analyzed using scout software to determine optical constants of the thin films. Electrical properties Cu₂O and ZnS:Al thin films, at room temperature will be obtained by four point probe method in which measurements will be obtained using Keithley 2400 Source Meter. From I-V characteristics of Cu₂O-ZnS:Al p-n junction, the solar cell performance parameters e.g fill factor (FF), conversion efficiency (η), dark currents (I₀) and open circuit voltage (V₀) will be obtained.