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# Characterization of $Sn_xSe_y/SnO_2$:Co P-N Junction Deposited by Spray Pyrolysis for Photovoltaic Application

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Search for semiconducting materials for photovoltaic application has attracted a lot of attention recently. This research will involve characterization of $Sn_xSe_y$: SnO2-Co P-N as a solar cell material. SnSe is a p type semiconductor with a direct band gap and high absorption in the visible region spectrum. Cobalt doped tin oxide is not only a direct band gap semiconductor but also has a wide band gap and high transmittance. Solar cells making use either of the two materials have been fabricated and have achieved good efficiencies. A solar cell using the two materials for a P-N junction is yet to be fabricated. In this research Co-doped $SnO_2$ and SnSe thin films will be deposited on glass substrates using spray pyrolysis technique.The precursor solution will be prepared by dissolving 0.025 M of stannic chloride ($SnCl_4.5H_2O$) and different amounts of cobalt nitrate 6-hydrate ($Co(NO_3)_2:6H_2O$) and 1-1 dimethyl selenourea $C_3H_8N_2Se$. Different thin films such as Sno2, Co-$SnO_2$, SnSe and Co-$SnO_2$: SnSe will be prepared. Optical properties of thin films will be characterized i.e. absorbance spectra, transmittance and reflectance with UV-VIS-NIR spectrophotometer and the band gap of the films will be analysed by use of scout software. Electrical characterization especially sheet resistivity will be measured using the four point probe method. Thin films with optimum properties will be used ot fabricated a P-N junction through double deposition. I-V characteristics of the junction will be done using Keithley 2400 source meter and a computer. Fill factor (FF), open circuit voltage ($V_{oc}$), and efficiency of the junction will be obtained.