**Antimony Selenide (Sb2Se3) based solar cell with SnS as Back Surface Field Layer**

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**Abstract**

Solar energy is one of the most common renewables and environment-friendly energy sources that are currently undergoing rapid research and implementation to fulfill rising global energy demand, owing to its relative abundance. Furthermore, the growing usage of solar energy necessitates the advancement of innovative and efficient photovoltaic (PV) technologies with lower production prices and improved power conversion efficiency (PCE). Antimony selenide is a p-type emerging photovoltaic absorber material having a direct band gap of ~1.2 eV and a high absorption coefficient (~105 cm-1) and it has earth-abundant and less toxic precursor materials. The main objective of this work is to explore the probability of refining the efficiency of the Sb2Se3 solar cell. For this purpose, a novel back surface field (BSF) SnS layer has been introduced in between the rear contact (Mo) and absorber layer in the Sb2Se3 solar cell constituted by a fine buffer layer of CdS above the absorber layer, Sb2Se3. The optimum values ​of the solar cell structure Ag/CdS/Sb2Se3/SnS/Mo giving maximum output efficiency have been determined by varying the physical parameters such as thickness, doping concentration, and defect density. The proposed cell gives an efficiency of 32.59 % and Voc of 0.95 V at 300 K using a thickness of 0.05 μm thin SnS and CdS layer, and 1.5 µm Sb2Se3 layer. A solar cell capacitance simulator in 1 dimension (SCAPS-1D) software has explored of the solar-cell properties of the antimony selenide (Sb2Se3). A comparison of photovoltaic parameters with and without SnS layer (BSF) is also done.

**Keywords:** antimony selenide (Sb2Se3); SCAPS; solar cell; BSF; SnS