CHARACTERIZATION OF THERMALLY EVAPORATED ANTIMONY SELENIDE (Sb_2 Se_3) FILMS ON DIFFERENT BUFFER LAYERS

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Antimony selenide (Sb2Se3) has emerged as a promising absorber material for thin-film photovoltaics (PV) applications due to its optimal bandgap (1.1–1.2 eV), high absorption coefficient (>105^{-1} cm), low toxicity, and steadily increasing power-conversion efficiency (PCE) [1,2]. However, the performance of Sb2Se3-based devices strongly depends on the quality of the interface between the absorber and the buffer layer [3-5].

In this study, Sb_2Se_3 thin films were deposited by thermal evaporation onto soda-lime glass (SLG) substrates coated with fluorine-doped SnO_2 (FTO), which served as the conductive electrode. Prior to Sb_2Se_3 deposition, different buffer layers-tin oxide (SnO_2), cadmium sulfide (CdS), and titanium dioxide (TiO_2)-were deposited to systematically investigate their influence on thin-film growth, structural properties, and interfacial quality. Thermal evaporation was chosen due to its simplicity, high reproducibility, and compatibility with vacuum-based thin-film device fabrication. Furthermore, the relatively low melting point and high vapor pressure of Sb_2Se_3 make this technique particularly suitable, enabling controlled deposition and the formation of uniform, high-quality thin films. Structural and morphological characterizations were carried out to assess the impact of buffer layer selection on the structural integrity and overall quality of the Sb_2Se_3 thin films.

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