Extensive optical studies of Sb_2Se_3 thin film absorbers

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Currently, antimony selenide (Sb_2Se_3) has attracted worldwide attention as a solar absorber due to its desirable optoelectrical properties and binary composition with environmentally friendly elements. In the present work, Sb_2Se_3 films were prepared by the two-step process. At first, the metallic antimony (Sb) layers were deposited by DC sputtering on glass substrates and selenium (Se) layer of 1 μm thickness was deposited on Sb layers. Finally, the bilayers were annealed in rapid thermal process (RTP) system. The consummate optical analysis of such films is indispensable for more preponderant designing of heterojunction solar cells because only the optical properties give the information to understand their electronic properties and band structures. Therefore, an exhaustive investigation on the optical properties of Sb_2Se_3 films was made using the transmittance and reflectance measurements. The absorption coefficient was $>10^4$ cm^{-1} for the films. The band gap of the layers was determined from the differential reflectance spectra that varied in the range of, 1.32-1.21 eV. This study has also conclusively shown that the Sb_2Se_3 films prepared are suitable for solar cell absorbers.