Optical interactions in the InSe/CdSi interface

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Abstract

In this work, the structural and optical properties of the InSe/CdSe heterojunction are investigated by means of X-ray diffraction and ultraviolet-visible light spectrophotometery techniques. The hexagonal CdSe films which were deposited onto amorphous InSe and onto glass substrates at vacuum pressure of 10^{-5} mbar, exhibited interesting optical characteristics. Namely, the absorption, transmission and reflection spectra which were recorded in the incident light wavelength range of 300-1100 nm, for the InSe, CdSe and InSe/CdSe interface revealed a direct allowed transition energy band gaps of 1.44, 1.85 and 1.52 eV, respectively. The valence band offset for the interface is found to be 0.36 eV. On the other hand, the dielectric constant spectral analysis displayed a large increase in the real part of the dielectric constant associated with decreasing frequency below 500 THz. In addition, the optical conductivity spectra which were analyzed and modeled in accordance with the Drude theory displayed a free carrier average scattering time of 0.4 fs and drift mobility of 6.65 cm^2/Vs for the InSe/CdSe interface. The features of this interface nominate it as a promising candidate for the production of optoelectronic Schottky channel and as thin film transistor.