Title:	Analysis of different vacuum annealing levels for ZnSe thin films as potential buffer layer for solar cells
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Abstract:	In order to seek potential buffer layer, the influence of different vacuum annealing levels on physical properties to e-beam evaporated Zinc Selenide (ZnSe) thin films are meticulously investigated herein. The X-ray diffraction patterns of vacuum-annealed ZnSe films confirmed the prominent (111) reflection of the cubic phase where the crystallite size is found maximum (29 nm). The wavy optical transmittance spectra are observed for these ZnSe films, where higher transparency is observed in the visible region. A blue shift in the optical band gap (2.56–2.81 eV) and shrink in refractive index from 2.49 to 2.40 is observed with increasing vacuum levels. The HRTEM images demonstrated (111), (220), and (311) orientations of the lattice planes, and EDS patterns confirmed deposition of ZnSe films. The ohmic nature of the analyzed ZnSe thin films is validated by the I–V characteristics where the resistivity is found in the order of 102 Ω-cm for vacuum-annealed and 104 Ω-cm for the pristine films. The AFM images indicated hill-like structures where the roughness is found to vary with vacuum level. The physical properties of ZnSe films are conspicuously tailored by vacuum annealing levels, and the findings recommend the use of ~ 5 × 10−3 mbar vacuum-annealed ZnSe thin films as potential buffer layer to the solar cells.
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