Abstract

In this work, germanium doped cesium tin triiodide (CsSnI3-Ge) perovskite thin films, incorporated with a 5mole% germanium (Ge) concentration were deposited on fluorine doped tin (IV) oxide (FTO) substrates using spin coating technique and the films were synthesized under different spin coating speeds. Ge was used as a dopant to curb the problem of the rapid oxidation of tin (II) ions (Sn2+) to tin (IV) ions (Sn4+) in the presence of oxygen. Optical measurements were done using ultraviolet visible (UV-Vis) spectrophotometer, structural measurements were carried out using an X-ray diffraction (XRD) machine and the morphological analysis was done using a scanning electron microscope (SEM). The CsSnI3-Ge layer deposited at a spin coating speed of 4000 revolutions per minute(rpm) displayed the highest absorbance with a band gap value in the range of 2.85 eV to 3.36eV which was higher than the ideal value of ~1.5 eV. Structural analysis on the different CsSnI 3-Ge films displayed a consistent orthorhombic structure across all samples and SEM images revealed almost identical crystallite sizes. Generally, the perovskite film synthesized by spin coating speed of 4000 rpm displayed higher absorbance, higher crystallinity and a possibly uniform film morphology making it the optimal layer for solar cell applications.