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A review of the deposition of Sb_2S_3 film by spin coating method for thin film solar cell applications

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In last decades, the study of thin films has increased intensively in the solar cell technology because of the raw material can be obtained easily, cheaper and abundant. Various types of thin films are developed into different techniques with different conditions. In that order, the Antimony trisulfide (Sb_2S_3) has received a little attention as a potential candidate in solar energy conversion. The constituent materials (Sb and S) are abundant and more environmentally acceptable compared to the cadmium-related materials used in the fabrication of some advanced thin film solar cells. Also, high absorption coefficient, low melting point, air/moisture-stability and bandgap (Eg) of 1.2–1.8 eV of Sb_2S_3 perfectly matches with required Eg values for the top sub cell in Si based tandem dual-junction solar cells, yielding a maximum theoretical PCE exceeding 40%. Different film deposition methods such as, chemical bath deposition, Successive Ionic Layer Adsorption and Reaction (SILAR), electro deposition, flash evaporation, spray pyrolysis and spin coating, etc have been published and among them, the spin coating was found to be an effective method. In this review, Sb_2S_3 film preparation by spin coating was investigated. In most of the studies, $SbCl_3$ and thiourea have been used as precursors for Sb and S respectively and these precursors were mixed with 2-methoxyethanol (2-ME) and stirred for few hours depending on the molar ratio of the solutes. Also, the precursor solutions have been deposited with various speed and time. The quality and characters of the Sb2S3 film were varied with various preparation conditions. These films have been tested by XRD, UV-Visible absorption spectroscopy, scanning electron microscopy (SEM) measurements. A great amount of investigations has been going on developing and modifying these various types of Sb_2S_3 films with different HTM (Hole Transport Material) and counter electrodes to achieve a higher efficiency.

Keywords: *cheap, efficiency, Sb_2S_3, spin coating, thin film*