Spin-coated kesterite CZTS thin films for photovoltaic applications

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Abstract

Copper zinc tin-sulfide (CZTS) films have been widely studied over recent years due to the inherent advantages of low cost, high absorption coefficient (≥ 104 cm−1), suitable band gap (∼1.5 eV) and nontoxicity. In this work, spin coating was used to obtain CZTS films of various compositions and degrees of crystallization on glass substrates, which were then annealed at 500 °C in a N2 atmosphere by using a rapid thermal processing (RTP) furnace in order to optimize their structure. Non-stoichiometric precursors and low spinning speeds resulted in a lower sheet resistance, which is considered to be a result of lower degree of crystallization. Furthermore, the non-stoichiometric films had a high optical band gap (> 1.66 eV) whereas the band gap of the stoichiometric films (1.4 to 1.6 eV) was close to the optimal value (1.5 eV) for solar-cell applications.

Keywords

Copper zinc tin-sulfide (CZTS); Thin film; Photovoltaics; Spin coating; Rapid thermal processing