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Fabrication of a Ti-substituted CuGaS₂ intermediate band material by alternate sputtering

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Abstract

Ti-substituted CuGaS₂ (Ti-CGS) thin film, a well candidate intermediate band (IB) material, has been successfully synthesized via a well synthetic route by alternate sputtering. The results revealed that the film have a compact morphology and are comprised of a crystalline chalcopyrite single phase Ti-CGS. Due to the presentation of Ti atoms, the IBs were introduced and additional sub-band-edge responses were directly observed in absorption spectroscopy. In the Ti-CGS thin film, except an intrinsic band-edge response observed at 510 nm ('A', 2.31 eV), two distinct sub-band-edge responses are observed at 856 nm ('B', 1.45 eV) and 1418 nm ('D', 0.87 eV). Besides, one weak sub-band-edge responses are found at 1102 nm ('C', 1.13 eV), which is in accord with theoretical prediction. The present report might provide a promising fabrication process for discovering the multiple IBs in the Ti-CGS film.

Keywords: Solar energy materials; Intermediate band; Light absorption; Sputtering; Thin films;

Ti-substituted CuGaS₂ film

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