

Understanding the Performance and Loss Mechanisms in Ag Alloy CZTS Solar Cells: Photocurrent Generation, Charge Separation, and Carrier Transport

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Abstract : The CZTS absorber layer doped with a silver (Ag) is one of the candidates that suggest improving the efficiency of thin films. Silver element functions to reduce antisite defects, increase grain size and create the plasmonic effect. In this work, an experimental study has been done to investigate the electrical and physical properties of CZTS, ACZTS, and AZTS. Ag replaces the Cu in $(\text{Cu}_{1-x}\text{Ag}_x)_2\text{ZnSnS}_4$ (ACZTS) is up to $x \leq 1$. ACZTS thin-films solar cells have been deposited by sol-gel spin coating method. There are a total of 19 samples done with 11 significant percentages (0%, 10%, 20%... 100%) to show the whole phenomena of efficiency rate and nine specific percentages to find out the best concentration rate for Ag-doped. The obtained results can be helpful for better understanding ACZTS layers.

Keywords : CZTS, ACZTS, AZTS, silver, antisite, efficiency, thin-film solar cell

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