

First Investigation on CZTS Electron affinity and Thickness Optimization using SILVACO-Atlas 2D Simulation

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Abstract : In this paper, we study the performance of $\text{Cu}_2\text{ZnSnS}_4$ (CZTS) based solar cell. In our knowledge, it is for the first time that the FTO/ZnO:Co/CZTS structure is simulated using the SILVACO-Atlas 2D simulation. $\text{Cu}_2\text{ZnSnS}_4$ (CZTS), ZnO:Co and FTO ($\text{SnO}_2\text{:F}$) layers have been deposited on glass substrates by the spray pyrolysis technique. The extracted physical properties, such as thickness and optical parameters of CZTS layer, are considered to create a new input data of CZTS based solar cell. The optimization of CZTS electron affinity and thickness is performed to have the best FTO/ZnO: Co/CZTS efficiency. The use of CZTS absorber layer with 3.99 eV electron affinity and 3.2 μm in thickness leads to the higher efficiency of 16.86 %, which is very important in the development of new technologies and new solar cell devices.

Keywords : CZTS solar cell, characterization, electron affinity, thickness, SILVACO-atlas 2D simulation

Conference Title : ICAAPMS 2023 : International Conference on Advances in Applied Physics and Materials Science

Conference Location : Venice, Italy

Conference Dates : June 15-16, 2023