

NUMERICAL SIMULATION OF LEAD-FREE BISMUTH PEROVSKITE BY USING SCAPS (SOLAR CELL CAPACITANCE SIMULATOR)

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A perovskite solar cells were studied using the Solar cell capacitance simulator (SCAPS). The effect of the cation on the performance of perovskite solar cells with $\text{MA}_3\text{Bi}_2\text{I}_9$ as the light-absorbing material and perovskite solar cells with $\text{Cs}_3\text{Bi}_2\text{I}_9$ as the light-absorbing material were simulated and compared. $\text{MA}_3\text{Bi}_2\text{I}_9$ and $\text{Cs}_3\text{Bi}_2\text{I}_9$ achieved efficiencies of about 8.6% and 13.6%, respectively. The fluctuation in light absorption caused by the cations significantly affects the performance of perovskite solar cells. This research also investigated the effects of band-to-band recombination, absorber layer defect density, perovskite-electron transport layer interface defect density, perovskite-hole transportation layer defect density, series resistance, shunt resistance, and operating temperature on the solar cell performances.

Keywords: Perovskites, Solar Cells, Simulation, Performances