

Thickness Dependence of Window Layer on $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ Perovskite Solar Cel

Abstract

$\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ has been studied experimentally and has shown promising results for photovoltaic application. To enhance its performance, this study investigated the effect of varying thickness of FTO, TiO_2 , and $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ for a perovskite solar cell with the structure glass/FTO/ TiO_2 / $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ /Spiro-OMeTAD/Ag studied using SCAPS-1D simulator software. The output parameters obtained from the literature for the device were 26.11 mA/cm^2 , 1.25 V , 69.89% , and 22.72% for J_{sc} , V_{oc} , FF, and η , respectively. The optimized solar cell had a thickness of 100 nm , 50 nm , and 300 nm for FTO, TiO_2 , and $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ layers, respectively, and the device output were 25.79 mA/cm^2 , 1.45 V , 78.87% , and 29.56% for J_{sc} , V_{oc} , FF, and η , respectively, showing a remarkable increase in FF by 8.98% and 6.84% for solar cell efficiency. These results show the potential of fabricating an improved $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ perovskite solar cell.

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