

Effect of CsCl additive on the morphological and optoelectronic properties of formamidinium lead iodide perovskite

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Abstract : The quality of the perovskite films plays a crucial role in improving the optoelectronic properties and performance of perovskite solar cells. Here, the high quality $\text{Cs}_x\text{FA}_{1-x}\text{PbI}_3$ perovskite films with different compositions ($x= 0, 5, 10$ and 15) are achieved by controlling the amount of CsCl in the respective FAPbI_3 precursor solution. The effects of CsCl addition on the morphological and optoelectronic properties of the resulting perovskite films and on the performance of the corresponding devices are systematically studied. Introduction of CsCl into FAPbI_3 showed a great potential to stabilize the α - FAPbI_3 perovskite phase by forming $\text{Cs}_x\text{FA}_{1-x}\text{PbI}_3$ films with improved morphology and carrier lifetimes. With an optimal 10 mol% CsCl additive, the average power conversion efficiency (PCE) is increased from $16.83 \pm 0.30\%$ for the reference FAPbI_3 based PSCs to $18.87 \pm 0.25\%$ (with a steady-state PCE of 18.89%). Moreover, the optimized device performance was more stable after 20 days than the controlled one under $\sim 40\%$ humidity in air.

Keywords : perovskite, perovskite solar cells, formamidinium lead iodide, efficiency