Effect of MAI Concentration on the Performance of Electrodeposition based Perovskite Solar Cells

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Today, the verified power conversion efficiency of perovskite solar cells (PSCs) have reached by 22.1 %, which are usually fabricated by spin-coating process with toluene dropping process. However, the spin-coating process is hardly to scale-up because the uniformity of perovskite layer is required. Furthermore, the toxic solvents, such as DMF, toluene, etc., are involved in the spin-coating process, which is unhealthy for humans. For these reasons, we believed that enlarged area with non-toxic process is required instead of the spin-coating process. Electrodeposition process is a low-cost and mature industrial technique for preparing large-scale coatings via electrochemical reduction-oxidation. The PbO_X thin film prepared via electrodeposition process is easily to control including film thickness and uniformity. In this study, we try to optimize the electrodeposition process conditions via controlling the current and MAI solution concentration to fabricate a large-area and uniform PbO_X thin film. In addition, two-step process to fabricate $CH_3NH_3PbI_3$ is introduced in this study. And the absorbance septum clearly show the PbO_X can indeed convert into perovskite in a short time. The two step solution process the conversion efficiency of 11.72% and one step solid reaction process the conversion efficiency of 9.15% can be achieved with active area in 4 cm^2.