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Hot Air Flow Annealing of $MAPbI_3$ Perovskite: Structural and Optical Properties

Authors : Mouad Ouafi, Lahoucine Atourki, Larbi Laanab, Erika Vega, Miguel Mollar, Bernabe Marib, Boujemaa Jaber

Abstract : Despite the astonishing emergence of the methylammonium lead triiodide perovskite as a promising light harvester for solar cells, their physical properties in solution-processed $MAPbI_3$ are still crucial and need to be improved. The objective of this work is to investigate the hot airflow effect during the growth of $MAPbI_3$ films using the spin-coating process on their structural, optical and morphological proprieties. The experimental results show that many physical proprieties of the perovskite strongly depend on the air flow temperature and the optimization which has a beneficial effect on the perovskite quality. In fact, a clear improvement of the crystallinity and the crystallite size of $MAPbI_3$ perovskite is demonstrated by the XRD analyses, when the airflow temperature is increased up to 100°C. Alternatively, as far as the surface morphology is concerned, SEM micrographs show that significant homogenous nucleation, uniform surface distribution and pin holes free with highest surface coverture of 98% are achieved when the airflow temperature reaches 100°C. At this temperature, the improvement is also observed when considering the optical properties of the films. By contrast, a remarkable degradation of the $MAPbI_3$ perovskites associated to the PbI_2 phase formation is noticed, when the hot airflow temperature is higher than 100°C, especially 300°C.

Keywords : hot air flow, crystallinity, surface coverage, perovskite morphology
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