Efficiency enhancement of p-i-n type $CH_3NH_3PbI_3$ perovskite solar cells by controlling interface area via nano-imprinting

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Organic-inorganic perovskite solar cells have attracted attention in the past few years due to their ambipolar charge transport ability, long carrier diffusion length and strong light absorptivity. The efficiency of organic-inorganic perovskite solar cells is rapidly increasing and power conversion efficiency of more than 23% has been reported so far. Among the various device architecture of organic-inorganic perovskite solar cells, the p-i-n type perovskite solar cells can be fabricated by low-temperature solution process. Due to straightforward and cost-effective process, the p-i-n type devices are good for flexible devices, which necessarily require low temperature process. However, the mobility of holes in the $CH_3NH_3PbI_3$ perovskite material is reported to be relatively smaller compared to that of electrons so the electron flux is not balanced with the hole flux. Therefore, here, we controlled the surface area of p-type hole conductor by nanoimprinting in order to improve the hole flux at perovskite/hole conductor interface.