Efficient Perovskite Thin Film Solar Cells on Nanostructrues

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Abstract

Lead halide perovskite materials, such as $CH_3NH_3PbI_3$ and $CH_3NH_3PbI_{3-x}Cl_x$, have emerged as attractive candidates for low-cost and efficient solar cells due to their appealing optical and electrical properties. They can be readily synthesized at low temperature from earth-abundant elements thus greatly lowering the requirement on fabrication facilities. More importantly, these materials hold promise for high performance photovoltaics devices, i. e. solar cells, due to higher charge carrier mobilities and longer diffusion lengths than many organic semiconductors. In addition, their band-gap can be conveniently and widely tuned via doping process. Over the past few years, interest on perovskite photovoltaics has surged, triggered by the fast development of low-cost and efficient lead halide perovskite thin film solar cells. However, further improve performance of perovskite solar cell still remains as a challenge. Here we report fabrication of high efficiency thin film perovskite solar cells on nanostructures which demonstrate excellent flexibility and improved performance. Our systematic investigations have revealed that improved light absorption leads to device performance enhancement. Meanwhile, nanostructures also help to maintain device structure integrity, which is especially important for flexible devices.