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Polymer assisted growth of high-quality perovskite films by Lewis acid-base adduct for efficient planar-heterojunction solar cells

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Highlights

1. Polymer assisted growth of high-quality perovskite films was demonstrated.
2. Polymer PMMA can retard nucleation and crystal growth of perovskite.
3. The interaction between the perovskite films and PMMA was addressed.
4. Planar-heterojunction solar cells with efficiencies of 15% were achieved.

Abstract: Long-chain insulating polymers dissolved in perovskite precursor solution can assemble the polymer scaffold acted as the function of TiO_2 porous layer to improve the quality of the perovskite films. Here, perovskite films with high electronic quality were prepared by mediating nucleation and crystal growth. Polymer post treatment can induce Lewis acid-base reaction with $PbCl_2$, which alleviates the reaction velocity between $PbCl_2$ and CH_3NH_3I, and then retard perovskite crystallization. The interactions between the perovskite films and polymer with different concentration are addressed to interpret the function and evolution of the polymer long-chains during the annealing process. These solar cells exhibit efficiency more than 15% with small variation. Our work demonstrates the value of retarding