Composition- and Temperature-Dependent Crystal Formation of Cesium Lead Halide Perovskites and Its Solar Cell Application

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Halide perovskites have attracted great research efforts in the field of photovoltaics. Given their superior photophysical properties, the device based on these materials have achieved a rapid progress. However, organic-based perovskites are suffering from thermal instability, which will be an ultimate hurdle for commercialization. As an alternative, cesium lead halide perovskites are potential thermally stable light absorber. However, a lack of efficiency and phase stability hinders the further progress. Therefore, the aim of this research is to improve the photovoltaic performance and stability of CsPbI2Br perovskites. Two strategies are performed; first, the compositional modification is studied by incorporating potassium cations into the A-site of perovskite lattice. Second, the temperature dependence of crystal growth is investigated through the surface morphology, crystal structure, and chemical state of the differently-annealed perovskite films. These studies will provide the established experimental details and help to motivate further research efforts on all-inorganic halide perovskite-based solar cells.