Exploring stability of formamidinium lead trihalide for solar cell application

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Exploring stability of formamidinium lead trihalide for solar cell application

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Abstract: Formamidinium lead triiodide ($FAPbI_3$) is a promising photoactive perovskite for low-cost and efficient solar cells. This article reports on an experimental investigation on the stability of $FAPbI_3$ by comparison with that of widely-used methylamidinium lead triiodide ($MAPbI_3$). A hydration of the $FAPbI_3$ with moisture could be the dominant mechanism for its degradation in air, rather than a common thermal decomposition in the $MAPbI_3$. This can be mainly contributed to a relatively strong bond formation between formamidinium ions (FA^+) and I^-. Consequently, the stability of $FAPbI_3$ based devices can be greatly enhanced by removal moisture in the surrounding. This conclusion renders $FAPbI_3$ extremely attractive for stable perovskite solar cells with fine encapsulation.

Keywords: Perovskite; Solar cell; Stability; Cation

1. Introduction

A broad organic-inorganic series of hybrid metal iodide perovskites with the general formulation ABX_3 have been reported for solar cell application, where A is the organic cation such as methylammonium ($CH_3NH_3^+$) or formamidinium ($HC(NH_2)_2^+$) at the corner of cubic unit cell, B being a divalent metal (Pb^{2+}, Sn^{2+}) at the body center, and X being an halogen anion (Cl^-, Br^-, I^-) locating at the face center. Following the pioneer work of methylamidinium lead triiodide ($MAPbI_3$) perovskite