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Exploring stability of formamidinium lead trihalide for solar cell application

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Abstract: Formamidinium lead triiodide (FAPbI₃) is a promising photoactive perovskite for low-cost and efficient solar cells. This article reports on an experimental investigation on the stability of FAPbI₃ by comparison with that of widely-used methylammonium lead triiodide (MAPbI₃). A hydration of the FAPbI₃ with moisture could be the dominant mechanism for its degradation in air, rather than a common thermal decomposition in the MAPbI₃. This can be mainly contributed to a relatively strong bond formation between formamidinium ions (FA⁺) and I⁻. Consequently, the stability of FAPbI₃ based devices can be greatly enhanced by removal moisture in the surrounding. This conclusion renders FAPbI₃ 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 ABX₃ have been reported for solar cell application, where A is the organic cation such as methylammonium (CH₃NH₃⁺) or formamidinium (HC(NH₂)₂⁺) at the corner of cubic unit cell, B being a divalent metal (Pb²⁺, Sn²⁺) at the body center, and X being an halogen anion (Cl⁻, Br⁻, I⁻) locating at the face center. Following the pioneer work of methylammonium lead triiodide (MAPbI₃) perovskite

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