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利用者名（日本語）　:早瀬修二
Username (English)　:Shuzi Hayase
所属名（日本語）　:九州工業大学生命体工学研究科
Affiliation (English)　:Kyushu Institute of Technology
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1. 概要（Summary）

The all-inorganic perovskites suffer from a phase transition from cubic α-phase to δ-phase at their operation atmosphere. Here, we demonstrated that yttrium-induced perovskite crystallization gives significant phase stability in humid air. X in perovskite precursors was found to impede the crystal growth of perovskite film and finally was incorporated in CsPbI2Br perovskite lattice. This structural crystallization process induced by yttrium ion gave rise to denser compact films with small grains, accompanied with lattice rearrangement by partially substitution of Pb ion. As a result, 360-fold stability improvement was achieved under humid air with 65% RH compared with the reference film without yttrium ion. This gave the enhanced power conversion efficiency (PCE) of 13.23%, compared with the reference cells of 8.46%. Moreover, perovskite solar cells (PSCs) with yttrium ions exhibited superior long-term stabilitystored at ambient air with 65% RH without encapsulation

2. 実験（Experimental）

【利用した主な装置】 走査型電子顕微鏡

3. 結果と考察（Results and Discussion）

We incorporated X in CsPbI2Br structure. During the crystal growth, the X could interact with DMSO solvent in PbI2 planes and impede CsPbI2Br crystallization to form denser compact perovskite films with smaller size. The phase was stabilized and the α-phase perovskite was kept at ambient temperature. 360-fold stability improvement of CsPbI2Br films upon X addition was achieved in ambient atmosphere with 65% RH. The X-CsPbI2Br PSCs fabricated in humid air with 65% RH exhibited much enhanced efficiency of 13.23% with open-circuit voltage of 1.232 V compared with that of 8.46% for the reference PSCs, which can be ascribed to better crystalline quality with effectively passivation induced by X addition. Furthermore, the PSCs showed the tremendous stability improvement. Negligible efficiency loss was achieved after 14 h storage in humid air with 65% RH. This work demonstrates an effective way to design high quality of perovskite films through crystallization engineering induced by the addition of X and achieve higher performance of photovoltaic all-inorganic perovskite devices with superior stability.

4. その他・特記事項（Others）　なし

5. 論文・学会発表

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6. 関連特許（Patent）　なし