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Application of Mixed-Organic-Cation for High Performance Hole-conductor-free Perovskite Solar Cells

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Abstract: ABX₃-type organic lead halide perovskites have gained increasing attention as light harvester for solar cells due to their high power conversion efficiency (PCE). Recently, it has become a trend to avoid the use of expensive hole-transport materials (HTMs) and precious metals, such as Au, to be competitive in future commercial development. In this study, we fabricated mixed-cation perovskite-based solar cells through one-step spin-coating using methylammonium (CH₃NH₃⁺) and formamidinium (HN = CHNH₃⁺) cations to extend the optical absorption range into the red region and enhance the utilization of solar light. The synthesized hole-conductor-free cells with carbon electrode and mixed cations exhibited increased short-circuit current, outperforming the cells prepared with pure methylammonium, and PCE of 10.55%. This paper proposes an efficient approach for fabricating high-performance and low-cost perovskite solar cells.

Key words: *perovskite solar cells, mixed cations, hole-conductor-free, carbon electrode*

1. Introduction

Organic-inorganic metal hybrid perovskites have gained increasing attention as light sensitizers due to their low cost, high efficiency, and ease of fabrication. [1-9] Indeed, the power conversion efficiency (PCE) of perovskite solar cells (PSCs) has increased from 3.9% to 22.1% over the past few years. [10-12] Hence, PSCs are an excellent candidate for next-generation photovoltaic devices. In particular, MAPbI₃ is

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