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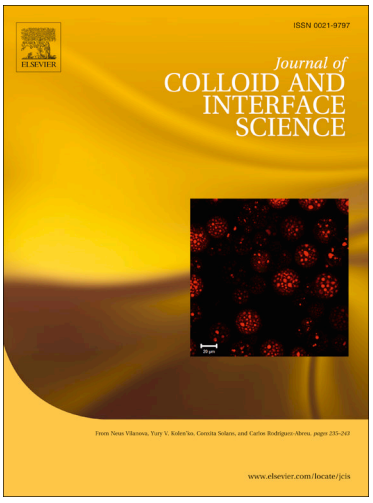

Additive-assisted One-step Formed Perovskite/Hole conducting Materials Graded Heterojunction for Efficient Perovskite Solar Cells

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Additive-assisted One-step Formed Perovskite/Hole conducting Materials Graded Heterojunction for Efficient Perovskite Solar Cells

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Abstract

Solar cells based on organometallic perovskite materials have been intensively investigated as the most promising next-generation photovoltaic technology. The quality of perovskite film and the heterojunction between perovskite and charge transporting materials dominate the performance of resulting devices. Herein, we report a facile additive-assisted method to form perovskite/2, 2', 7, 7'-tetrakis (N, N-di-p-methoxyphenylamine)-9, 90-spirobifluorene (spiro-OMeTAD) graded heterojunction by one step instead of spin-coating two layers separately. The additives concentration in anti-solution is optimized to form a mixed layer where spiro-OMeTAD is dispersive in upper perovskite films with a vertical gradient, and a capping layer with appropriate thickness. The incorporation of spiro-OMeTAD in anti-solution tremendously improve the crystallinity of perovskite films while the graded heterojunction and the derived capping layer contribute to reduced interfacial losses. Moreover, poly(methyl methacrylate) as the second additive in anti-solution further passivates defects in perovskite films. As a result, we realize perovskite solar cells with a power conversion efficiency of 15.72% based on perovskite-graded heterojunction, which is far beyond the control devices. This study demonstrates an effective extension of heterojunction engineering to fabricate efficient perovskite solar cells using simplified procedures.

Keywords: Perovskite solar cell; Graded heterojunction; Interfacial engineering; Solvent engineering

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