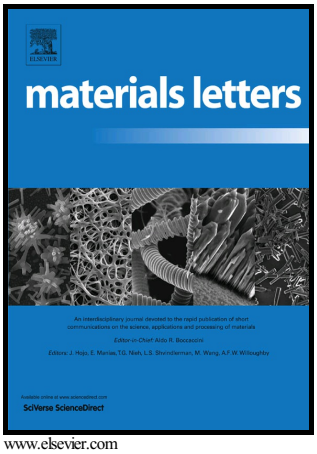

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Improved performance of inverted polymer solar cells using Cd_2SSe/ZnS quantum dots

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Abstract

Quantum dots (QDs) materials have been widely used in polymer solar cells (PSCs) to improve device performance. In this paper, the enhanced efficiency of PSCs by incorporating Cd_2SSe/ZnS (CSS-Z) QDs into active layer composed of Poly [N-9″-hepta-decanyl-2,7-carbazolealt-5,5-(4′,7′-di-2-thienyl-2′,1′,3′-ben-zothiadiazole)] (PCDTBT) : [6,6]-phenyl-C70-butyric acid methyl ester ($PC_{71}BM$) were demonstrated, and the power conversion efficiency (PCE) of devices was increased from 5.72% to 6.75%, accounting for an 18% enhancement compared to the control device. The light trapping of optimized devices is higher than that of the control device, which is beneficial to boost the transport of photo-induced charges. Furthermore, the CSS-Z QDs play a role of charge transfer state, substantially improving exciton dissociation, charge transport, leading to an increased short-circuit current density (J_{sc}) and decreased series resistance (R_s).

Keywords: Cd_2SSe/ZnS QDs, energy conversion, charge carrier transport, solar energy

1. Introduction