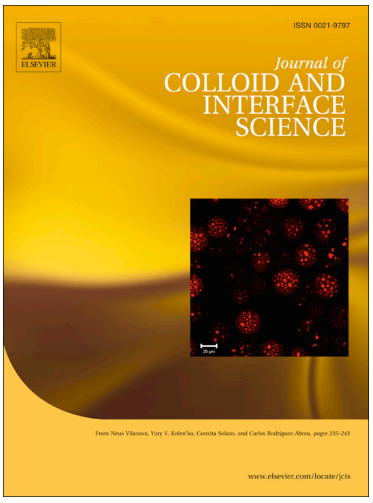

Regular Article

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A solution-processed binary cathode interfacial layer facilitates electron extraction for inverted polymer solar cells

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Abstract

The charge transfer and separation are significantly affected by the electron properties of the interface between the electron-donor layer and the carrier-transporting layer in polymer solar cells (PSCs). In this study, we investigate the electron extraction mechanism of PSCs with a low temperature solution-processed ZnO/PEI as electron transport layer. The incorporation of PEI layer can decrease the work function of ZnO and reduce interfacial barrier, which facilitates electron extraction and suppresses bimolecular recombination, leading to a significant performance enhancement. Furthermore, PEI layer can induce phase separation and passivite inorganic surface trap states as well as shift the interfacial energy offset between metal oxide and organic materials. This work offers a simple and effective way to improve the charge transporting property of organic photovoltaic devices.

Keywords: Electron Transport Layer, Electron Extraction, ZnO/PEI, Phase Separation, Charge Recombination

1. Introduction

In the past few decades, numerous efforts have been devoted to photovoltaic technology that converts sunlight to storable energy sources, such as electricity or solar fuels due to the rising energy crisis and environmental deterioration.[1] Polymer solar cells (PSCs) have many advantages including transparency, large-area, and light weight, which make them indispensable in the future.[2-13] Moreover, PSCs could particularly offer the simultaneous combination of a low module cost per peak watt and long term sustainability potential compared to silicon and other photovoltaic technologies. Recently, the intensive research in PSCs has made great progress upon developing novel donor materials and new device structure, and the best power-conversion

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