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Solution Processed Black Phosphorus Quantum Dots for High Performance Silicon/Organic Hybrid Solar Cells

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Abstract

In this letter, solution-processed black phosphorus quantum dots (BPQDs) were applied to enhance hole extraction of Si/poly-(3, 4-ethylenedioxythiophene): poly(styrenesulfonic acid) (PEDOT:PSS) heterojunction based hybrid solar cells. A remarkable improvement of power conversion efficiency (PCE) from 10.03 % to 13.60 % was achieved by the PEDOT:PSS/BPQDs-incorporated devices. Detailed investigations discover the influence of BPQDs on the hole extraction effect and work mechanism of BPQDs. Our work presents an avenue in using solution processed BPQDs for high performance hybrid solar cells.

Keywords: Black phosphorus quantum dots; Organic; Semiconductor; Hybrid solar cells; PEDOT:PSS

1. Introduction

In recent decades, silicon based organic/inorganic photovoltaic devices have

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