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Characterization and photovoltaic performance of organic device based on CoMTPP/p-Si heterojunction

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Abstract

Hybrid organic/inorganic heterojunction of nanocrystalline 5,10,15,20-Tetrakis(4-methoxyphenyl)-21H,23H-porphine cobalt(II), (CoMTPP) and p-Si was fabricated by using the conventional thermal evaporation technique. The morphologies of the CoMTPP/p-Si were investigated by scanning electron microscopy (SEM). The dark current-voltage (I-V) characteristics of Au/p-CoMTPP/p-Si/Al heterojunction diode measured at different temperatures ranging from 298 to 423 K have been investigated. Analytical approaches involving the thermionic emission and space charge limited currents (SCLC) were used to explain the I-V behavior in the forward bias. On the other hand, the carrier generation-recombination process limits the reverse current. The dependence of capacitance-voltage (C-2-V) for the device CoMTPP/p-Si was found to be almost linear which indicates that the junction behavior is abrupt nature and then the essential junction parameters were obtained. The performance of heterojunction showed a photovoltaic behavior with an open circuit voltage, V_{oc} , of 0.283 V, short circuit photocurrent I-SC, of 0.433 mA and power conversion efficiency, η_a of 3.6%. (C) 2013 Elsevier B.V. All rights reserved.

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