

Effect of interface modifiers on hole mobility in Hybrid Nanoporous Titanium dioxide (TiO₂) / Poly(3-hexylthiophene) (P3HT) solar cells

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Abstract

This study focuses on influence of interface modifiers on hole mobility in Hybrid Nanoporous Titanium dioxide (TiO₂) / Poly(3-hexylthiophene) (P3HT) nanocomposite by using time of flight technique. We found that the hole-mobility in the composite material is more than two orders of magnitude less than that of pristine P3HT. This may be due to poor polymer infiltration of the polymer into highly structured porous TiO₂. However, hole-mobility of the polymer in TiO₂/P3HT is increased to an order of magnitude when ruthenium based dye either Z907 or N719 is introduced at the TiO₂/P3HT interface. This is consistent with corresponding current density (J) - voltage (V) characteristics of thin TiO₂ / P3HT devices with or without dye interface layer. Better JV characteristics of the device and higher hole mobility of P3HT found in TiO₂ / dye / P3HT may be due to passivation of surface traps by the dye. © 2015 IEEE.