

Elaboration and Characterization of MEH-PPV/PCBM Composite Film Doped with TiO₂ Nanoparticles for Photovoltaic Application

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Abstract : The performance of photovoltaic devices with a light absorber consisting of a single-type conjugated polymer is poor, due to a low photo-generation yield of charge carriers, strong radiative recombination's and low mobility of charge carriers. Recently, it has been shown that ultra-fast photoinduced charge transfer can also occur between a conjugated polymer and a metal oxide semiconductor such as SnO₂, TiO₂, ZnO, Nb₂O₅, etc. This has led to the fabrication of photovoltaic devices based on composites of oxide semiconductor nanoparticles embedded in a conjugated polymer matrix. In this work, Poly [2-methoxy-5-(20-ethylhexyloxy)-p-phenylenevinylene] (MEH-PPV), (6,6)-phenyl-C₆₁-butyric acid methyl ester (PCBM) and titanium dioxide (TiO₂) nanoparticles (n-type) were dissolved, mixed and deposited by physical methods (spin-coating) on indium tin-oxide (ITO) substrate. The incorporation of the titanium dioxide nanoparticles changed the morphology and increased the roughness of polymers film (MEH-PPV/PCBM), and the photocurrent density of the composite (MEH-PPV/PCBM +n-TiO₂) was higher than that of single MEHPPV/ PCBM film. The study showed that the presence of n-TiO₂ particles in the polymeric film improves the photoelectrochemical properties of MEH-PPV/PCBM composite.

Keywords : photocurrent density, organic nanostructures, hybrid coating, conducting polymer, titanium dioxide

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