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Enhancement of photoelectrochemical and optical characteristics using a TiO2 nanoparticles interlayer in MEH-PPV heterojunction devices

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Abstract: In this work, MEH-PPV+TiO 2 composite material was prepared by incorporation of titanium oxide nonoparticles (TiO 2) into poly[2-methoxy-5-(2?-ethylhexyloxy)-p-phenylenevinylene] (MEH-PPV) polymer matrix and deposited by spin coating on glass and indium thin oxide (ITO) substrates. The absorbance of various MEH-PPV composites incorporating different concentrations of TiO 2 nanoparticles shows that addition of TiO 2 improves absorption of the composites. TiO 2 and the conjugated polymer have absorption in the UV and visible regions, respectively. As a result, the composite has slightly broader absorption. In addition, absorption of the composite shows that the polymer induces a certain structuring, as evidenced by the presence of fine structures. The effect of inserting a TiO 2 nanoparticles interlayer in the MEH-PPV polymer heterojunction device on the photoelectrochemical and optical characteristics of the device has been studied. The modified device (MEH-PPV+TiO 2) shows improved photocurrent density characteristics, and increased with TiO 2 concentration. The study showed that the presence of inorganic semiconductor nonoparticles (TiO 2) in polymer film improves the optical and the photovoltaic properties of MEH-PPV, and was designed to explore new approaches to improve light-collection efficiency in polymer photovoltaic.

Keywords : Hybrid composite materials, MEH-PPV, morphology, photocurrent