

# **Controlling recombination kinetics of hybrid nanocrystalline titanium dioxide/polymer solar cells by inserting an alumina layer at the interface**

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## **Abstract**

This work focuses on improving the performance of hybrid titanium dioxide (TiO<sub>2</sub>/polymer solar cells by modifying the metal oxide-polymer interface using an alumina (Al<sub>2</sub>O<sub>3</sub>) layer. Optical absorption measurement shows that polymer uptake of TiO<sub>2</sub> electrodes is improved when the electrode is coated with an alumina layer. This may be due to the more basic nature of the alumina layer. Insertion of alumina coating on nanocrystalline TiO<sub>2</sub> increases both current density and open-circuit voltage of TiO<sub>2</sub>/polymer devices, and so improves the overall efficiency by a factor of two. This is due to suppression of interfacial recombination of the carriers. The device with alumina coating shows external quantum efficiency of over 45% at the peak absorption of the polymer, and overall power conversion efficiency of over 1.4% under illuminations of intensity 70 mW/cm<sup>2</sup> with air mass 1.5 filter. Copyright © 2013 American Scientific Publishers.