

Section III

Dielectric devices for biotechnological and industrial applications

Invited Papers

Induced effects of patterned substrates on the electrical and photo-electrical properties of PTB7-Th:ICBA (1:1, wt.%) bulk-heterojunction solar cells

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Abstract: This work investigates the influence of nano-patterned substrates on the electrical and photoelectrical properties of photovoltaic devices based on PTB7-Th:ICBA (1:1, wt.%) thin films. The devices were fabricated on both flat and nano-patterned substrates prepared by nanoimprint lithography, followed by spin-coating deposition of the active layer. The results indicate that the use of patterned substrates leads to an improvement in several key photovoltaic parameters, including the maximum output power, short-circuit current density, and fill factor. These enhancements are attributed to reduced optical reflection and increased light absorption within the active layer. The morphology, topology, and optical properties of the thin films were investigated using atomic force microscopy, scanning electron microscopy, and optical spectroscopy (absorption measurements). The analyses reveal that the interpenetrating network formed by the regio-regular polymer and the fullerene derivative exhibits a high degree of homogeneity and surface uniformity. All fabrication and characterization processes were carried out under ambient conditions, considering an active device area of 0.4 cm².

Keywords: photovoltaic structures, nano-imprinting lithography, PTB7-Th, ICBA

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