## Inverted BHJ solar cells based on PTB7:$PC_{70}BM$ using $TiO_x$ as electron transport layer

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### Abstract

In recent years, bulk-heterojunction (BHJ) polymer solar cells (PSCs) have been widely studied because they offer low-cost, easy manufacture process, the possibility to be fabricated and deposited on flexible substrates and obtained large areas, which it is opposite case for the conventional silicon solar cells. It well know, that the calcium (Ca) and poly(3,4-ethylene dioxythiophene):poly-(styrenesulfonate) (PEDOT:PSS) are use as electron and hole transport layers in PSCs, respectively.[1] Nevertheless, the high reactivity of calcium with oxygen and the hygroscopical and acidic nature of PEDOT:PSS in environmental air can lead degradation of the active layer and the indium tin oxide (ITO) electrode resulting in poor stability.[2] In order to improve the stability, buffer layers and new inverted architecture structures have been developed for the PSCs.[3] In this work, we present the fabrication of PSCs based on thieno[3,4-b]-thiophene/ benzodithiophene (PTB7) and [6,6]-phenyl-C71-butyric acid methyl ester ($PC_{70}BM$) using an inverted structure. Titanium sub oxide (TiOx) film is used as electron transport layer, and this one was processed by via sol-gel method. [4] The inverted PSC was manufactured with the stack: ITO (120 nm) / $TiO_x$ (20 nm)/ PTB7:$PC_{70}BM$ (~100 nm) / $V_2O_5$ (5 nm) / Ag (100 nm) as is shown in figure 1a. In order to compare the performance of the cell, standard PSCs were manufactured. The performance parameters obtained for standard and inverted PSC were $V_{OC}$= 710 and 720 mV; $J_{SC}$= 14.7 and 16.4 mA/cm$^2$; FF= 0.71 and 0.68 and PCE= 7.3 and 7.9 %, respectively. Figure 1 shows the J–V curves under illumination at 1 sun (AM 1.5G spectrum), and under darkness for both structures manufactured.

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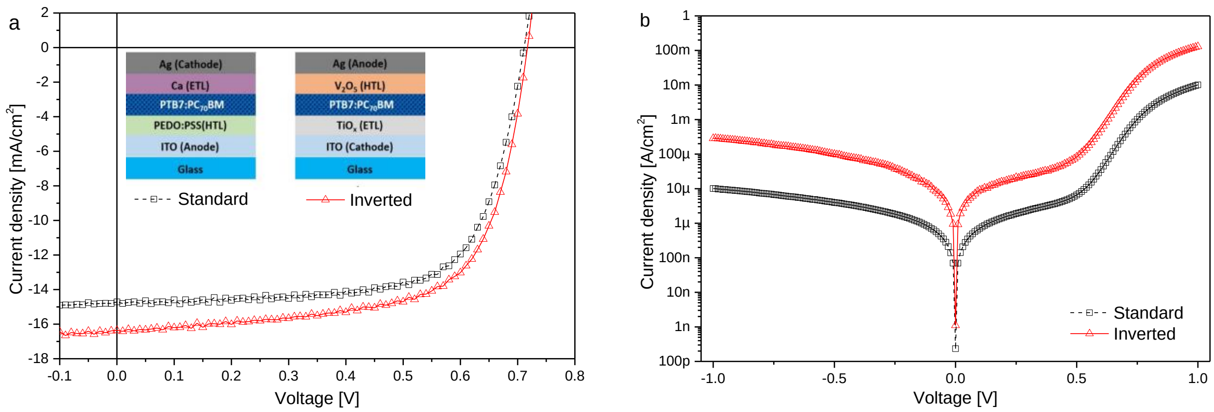


Figure 1 Current density – voltage characteristics under a) illumination AM 1.5G spectrum and b) darkness of both structures manufactured.