NANOSTRUCTURING DONOR/ACCEPTOR INTERFACES IN ORGANIC PHOTOVOLTAIC CELLS UTILIZING SOLUTION METHODS

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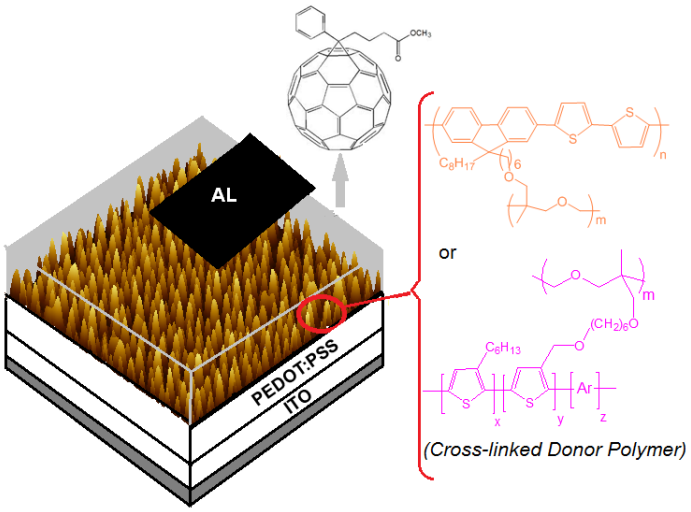
We report on the fabrication and characterization of organic photovoltaic cells, OPVs, with nanostructured donor layers prepared by spin coating. The nanostructuring method is based on the phase separation in blends combining a cross-linkable π-conjugated polymer and polystyrene. Insoluble columnar-grain layers of the cross-linked polymer could be obtained in the presence of a photo-acid catalyst, upon UV-illumination and thermal annealing, followed by the polystyrene removal with tetrahydrofuran [1, 2]. These layers were then covered with PCBM by spin coating, defining nanostructured donor/acceptor interfaces (Figure 1).

Figure 1. PV cell (scheme) with a nanostructured layer of cross-linked polymer (F8T2 or P3HT derivative).



The studied cross-linkable polymers are oxetane-functionalized polyfluorene-bithiophene (F8T2) and poly(3-hexylthiophene) (P3HT) derivatives [1,2]. In the case of P3HTs, they combine regioregular hexylthiophene blocks, oxetane-functionalized thienyl units, and non-substituted thienyl aromatic units (Ar in Figure 1) aiming at improving the polymers stability and devices performance. We demonstrate the control of structuring dimensions of such polymer layers and their effect on the OPVs performance. For comparison, cells based either on blends or planar bilayers of the same components were also investigated.

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