# IMPROVING ORGANIC SOLAR CELLS THROUGH USING TERNARY SYSTEMS

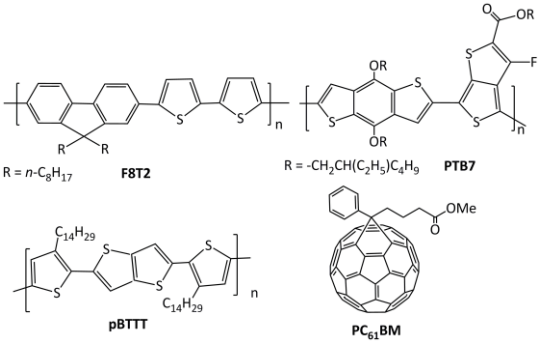
**Ana CHARAS, Joana FARINHAS, Ricardo OLIVEIRA, Jorge MORGADO**

*Instituto de Telecomunicações, IST, Av. Rovisco Pais, 1049-001, Lisbon, Portugal*
*ana.charas@lx.it.pt*

Bulk heterojunctions based on ternary blends of materials of complementary properties have been explored as an approach to improve organic photovoltaic cells through the improvement of the photon-absorption and/or charge transport within the devices.[1] Nevertheless, the mechanisms sustaining such device optimizations are often difficult to unveil due to the more complex nature of the ternary system, i.e. in diversity of materials properties and in morphologic features.

Here, two efficient ternary blends are reported: One is a dual polymer donor blend composed of poly[9,9'-dioctyl-fluorene-alt-bithiophene (F8T2) and poly[[4,8-bis[(2-ethylhexyl)oxy]benzo[1,2-b:4,5-b']dithiophene-2,6-diyl][3-fluoro-2-[(2-ethylhexyl)carbonyl]thieno[3,4-b]thiophenediyl]) (PTB7) and $PC_{61}BM$ as the electron acceptor, and the other is composed of PTB7, Poly(2,5-bis(3-hexadecylthiophen-2-yl)thieno[3,2-b]thiophene) (pBTTT) and $PC_{61}BM$. In both systems, the «second» polymer (F8T2 or pBTTT) exhibits a complementary absorption spectrum in relation to PTB7 in order to increase the photon harvesting within the active layer.

Cells of F8T2:PTB7:$PC_{61}BM$ at certain blending ratios exhibited PCEs as high as 7.39 %, representing an improvement of 28 % in comparison with the binary BHJ control devices. Studies on the photo-induced phenomena and the morphologic characteristics of the active layers of the cells elucidate on the causes for such improvements.




Scheme 1. Chemical structures of the materials used in ternary BHJ blends

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REFERENCES

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