Triphenylamine-Based Push–Pull σ–C60 Dyad As Photoactive Molecular Material for Single-Component Organic Solar Cells: Synthesis, Characterizations, and Photophysical Properties

Titre	Triphenylamine-Based Push–Pull σ–C60 Dyad As Photoactive Molecular Material for Single-Component Organic Solar Cells: Synthesis, Characterizations, and Photophysical Properties
Type de publication	Article de revue
Auteur	Labrunie, Antoine [1], Gorenflot, Julien [2], Babics, Maxime [3], Alévêque, Olivier [4], Dabos, Sylvie [5], Balawi, Ahmed H [6], Kan, Zhipeng [7], Wohlfahrt, Markus [8], Levillain, Eric [9], Hudhomme, Piétrick [10], Beaujuge, Pierre M [11], Laquai, Frédéric [12], Cabanetos, Clément [13], Blanchard, Philippe [14]
Editeur	American Chemical Society
Type	Article scientifique dans une revue à comité de lecture
Année	2018
Langue	Anglais
Date	22 Mai 2018
Numéro	10
Pagination	3474-3485
Volume	30
Titre de la revue	Chemistry of Materials
ISSN	0897-4756
Résumé en anglais	A push–pull σ–C60 molecular dyad was synthesized via Huisgen-type click chemistry and used as photoactive material for single-component organic solar cells. Steady-state photoluminescence (PL) experiments of the dyad in solution show a significant quenching of the emission of the push–pull moiety. Spin-casting of a solution of the dyad results in homogeneous and smooth thin films, which exhibit complete PL quenching in line with ultrafast photoinduced electron-transfer in the solid state. Spectroelectrochemistry reveals the optical signatures of radical cations and radical anions. Evaluation of the charge carrier mobility by space-charge limited current measurements gives an electron-mobility of μe = 4.3 × 10–4 cm2 V–1 s–1, ca. 50 times higher than the hole-mobility. Single-component organic solar cells yield an open-circuit voltage Voc of 0.73 V and a short-circuit current density of 2.1 mA cm–2; however, a poor fill factor FF (29%) is obtained, resulting in low power conversion efficiency of only 0.4%. Combined transient absorption (TA) and time-delayed collection field (TDCF) experiments show mostly ultrafast photon-to-charge conversion and a small component of diffusion-limited exciton dissociation, revealing the presence of pure fullerene domains. Furthermore, a strong field dependence of charge generation is observed, governing the device fill factor, which is further reduced by a competition between extraction and fast recombination of separated charges.

URL de la notice	http://okina.univ-angers.fr/publications/ua17187 [15]
DOI	10.1021/acs.chemmater.8b01117 [16]
Lien vers le document	https://pubs.acs.org/doi/10.1021/acs.chemmater.8b01117 [17]
Titre abrégé	Chem. Mater.

Liens
[1] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=19923
[2] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=28596
[3] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=28597
[4] http://okina.univ-angers.fr/olivier.aleveque/publications
[5] http://okina.univ-angers.fr/sylvie.dabos/publications
[6] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=28598
[7] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=28599
[8] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=28600
[9] http://okina.univ-angers.fr/eric.levillain/publications
[10] http://okina.univ-angers.fr/pietrick.hudhomme/publications
[11] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=28601
[12] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=21140
[13] http://okina.univ-angers.fr/clement.cabanetos/publications
[14] http://okina.univ-angers.fr/philippe.blanchard/publications
[15] http://okina.univ-angers.fr/publications/ua17187
[16] http://dx.doi.org/10.1021/acs.chemmater.8b01117
[17] https://pubs.acs.org/doi/10.1021/acs.chemmater.8b01117