

Multi-donor Molecular Bulk Heterojunction Solar Cells: Improving Conversion Efficiency by Synergistic Dye Combinations

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Supplementary information

Devices preparation and characterization

PCBM was purchased from NanoC and used as received. The PEDOT:PSS Baytron[®] PH500 suspension used to apply smoothing and hole conducting layers was received from HC Stark. As electrodes, indium-tin-oxide (ITO) coated glasses (Merck, sheet resistance $\leq 20 \Omega/\square$) and evaporated Al films (ca. 100 nm thick) were used. The ITO electrodes were cleaned in ultrasonic baths then modified by a spin-cast layer of Baytron (filtered through a 0.45 μm membrane just prior of casting at 5000 rpm), which was then dried at 130 °C for 15 min.

Devices with ITO/Baytron/1:2:PCBM/Al structure were realized from chloroform solutions containing 3 mg of each dye and 6 mg PCBM per ml. Spin-casting was done distributing the solutions drop by drop (5 \times) onto an already rotating stage (800-1000 rpm). The cells were completed by evaporation of Al through a round shadow mask (devices area of 0.29 cm²). After preparation, the solar cells were stored and characterised in an argon glove-box. The $J-V$ curves were recorded in dark and under illumination using a Keithley 236 source-measure unit and a homemade acquisition program. The light source was an AM1.5 Solar Constant 575 PV simulator (Steuernagel Lichttechnik, equipped with a metal halogenide lamp) and its intensity was measured by a broad-band power meter (13PEM001, Melles Griot). The devices were illuminated through the ITO electrode side. The efficiency values reported in this work are not corrected, neither for the possible solar simulator spectral mismatch nor for the reflection/absorbance of the glass/ITO/Baytron coated electrodes. IPCE spectra were recorded with a Perkin Elmer 7225 lock-in amplifier under monochromatic illumination at a chopping frequency of 210 Hz. The light from a W lamp was dispersed by an Acton SpectraPro150. Electronic absorption spectra were recorded with a Perkin Elmer Lambda 19 spectrophotometer.