ADVANCED MATERIALS TECHNOLOGIES

Supporting Information

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Compensation of Oxygen Doping in p-Type Organic Field-Effect Transistors Utilizing Immobilized n-Dopants

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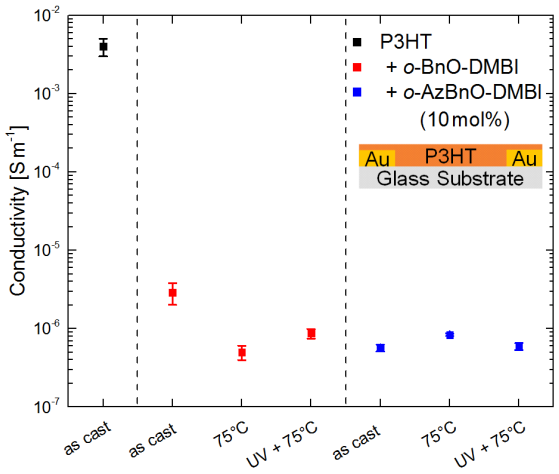

Figure S1. Conductivities of neat P3HT films sandwiched between gold contacts for IV-measurements in air and P3HT doped with 10 mol% *o*-BnO-DMBI and *o*-AzBnO-DMBI, respectively. Shown are as cast films as well as films, which were heated at 75°C on a hotplate for 1 hour and films, which were treated with UV light for 15 minutes before

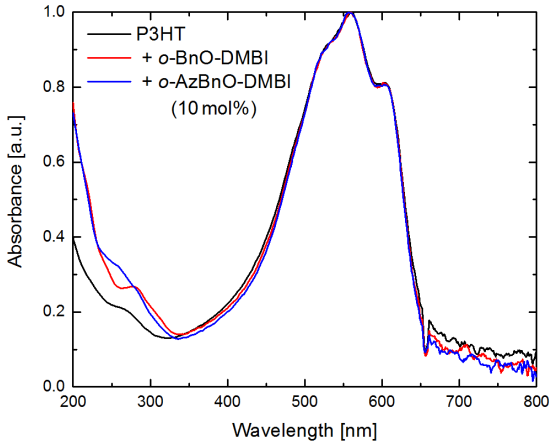

Figure S2. UV-Vis-spectra of P3HT and DMBI-doped P3HT films on quartz-glass.

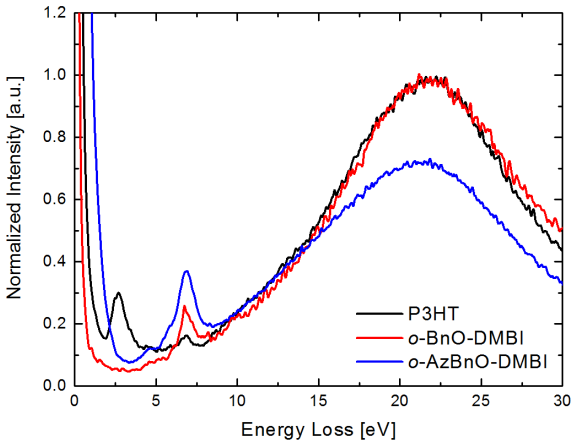

Figure S3. Electron energy loss spectra of pure P3HT, *o*-BnO-DMBI and *o*-AzBnO-DMBI films.

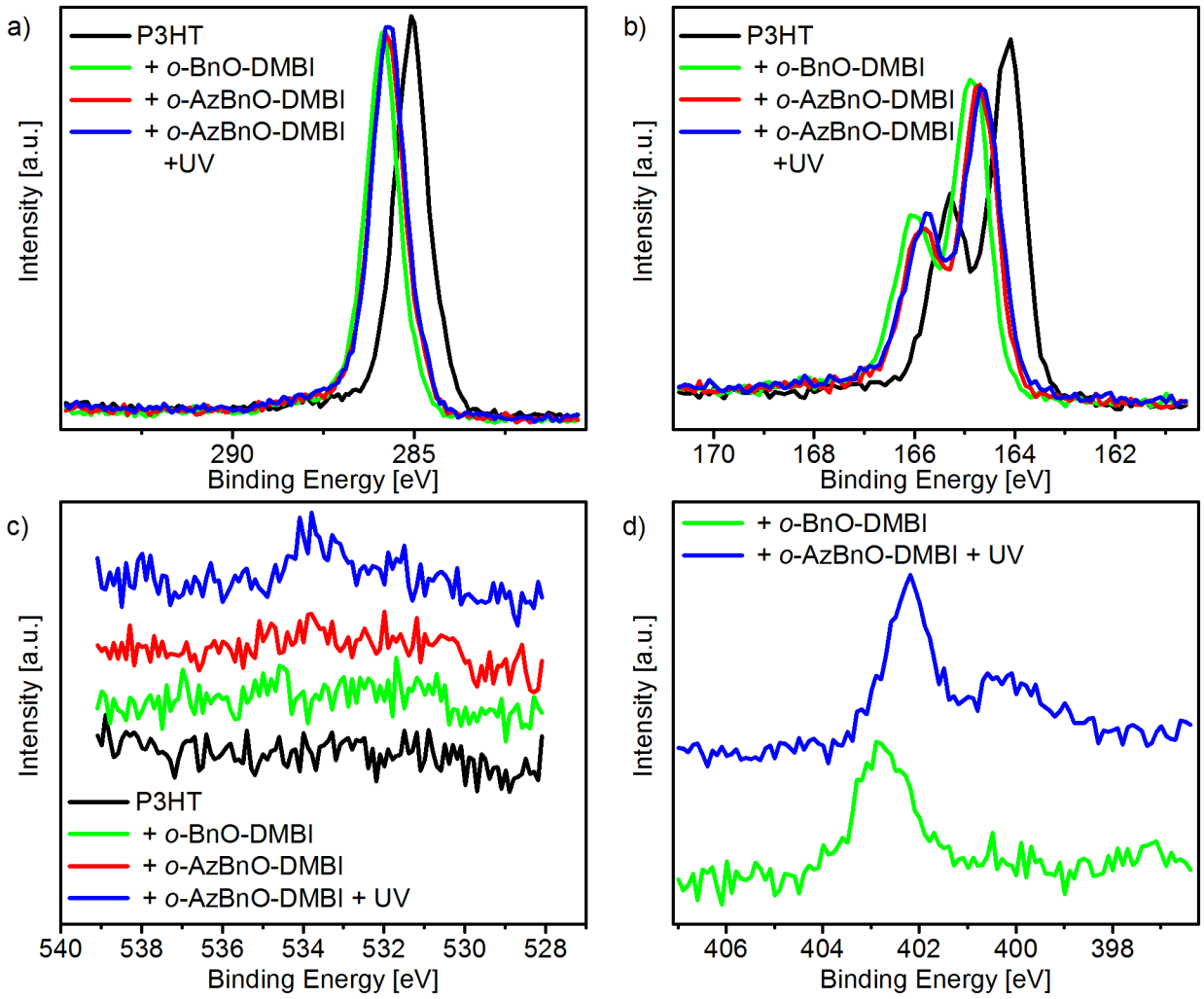

Figure S4. Photoelectron spectroscopy data for doped P3HT: a) C 1s level, b) S 2p level, c) O 1s level and d) N 1s level. P3HT processed in air is plotted in black. P3HT doped with 10 mol% *o*-BnO-DMBI is depicted in green. P3HT doped with 10 mol% *o*-AzBnO-DMBI is given in red and after UV-treatment in blue. The N 1s emission at 402-402.5 eV indicates the presence of charged DMBI molecules.

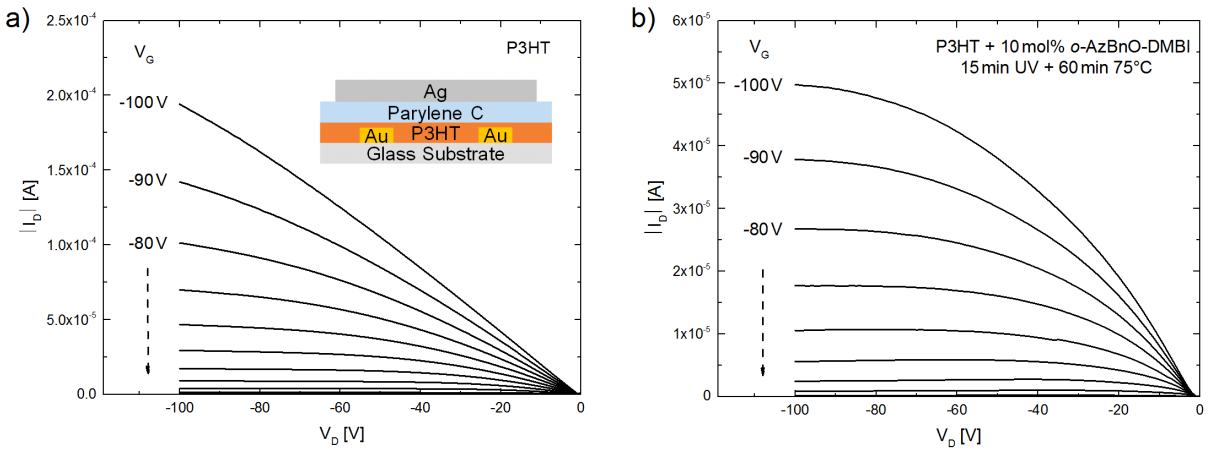

Figure S5. Output Curves of OFETs with active layers consisting of (a) P3HT and (b) P3HT doped with 10 mol% *o*-AzBnO-DMBI operated in air.

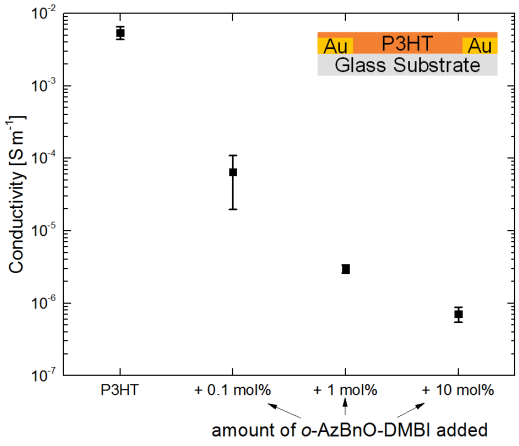

Figure S6. Conductivities of P3HT films doped with increasing content of *o*-AzBnO-DMBI sandwiched between gold contacts for IV-measurements in air.

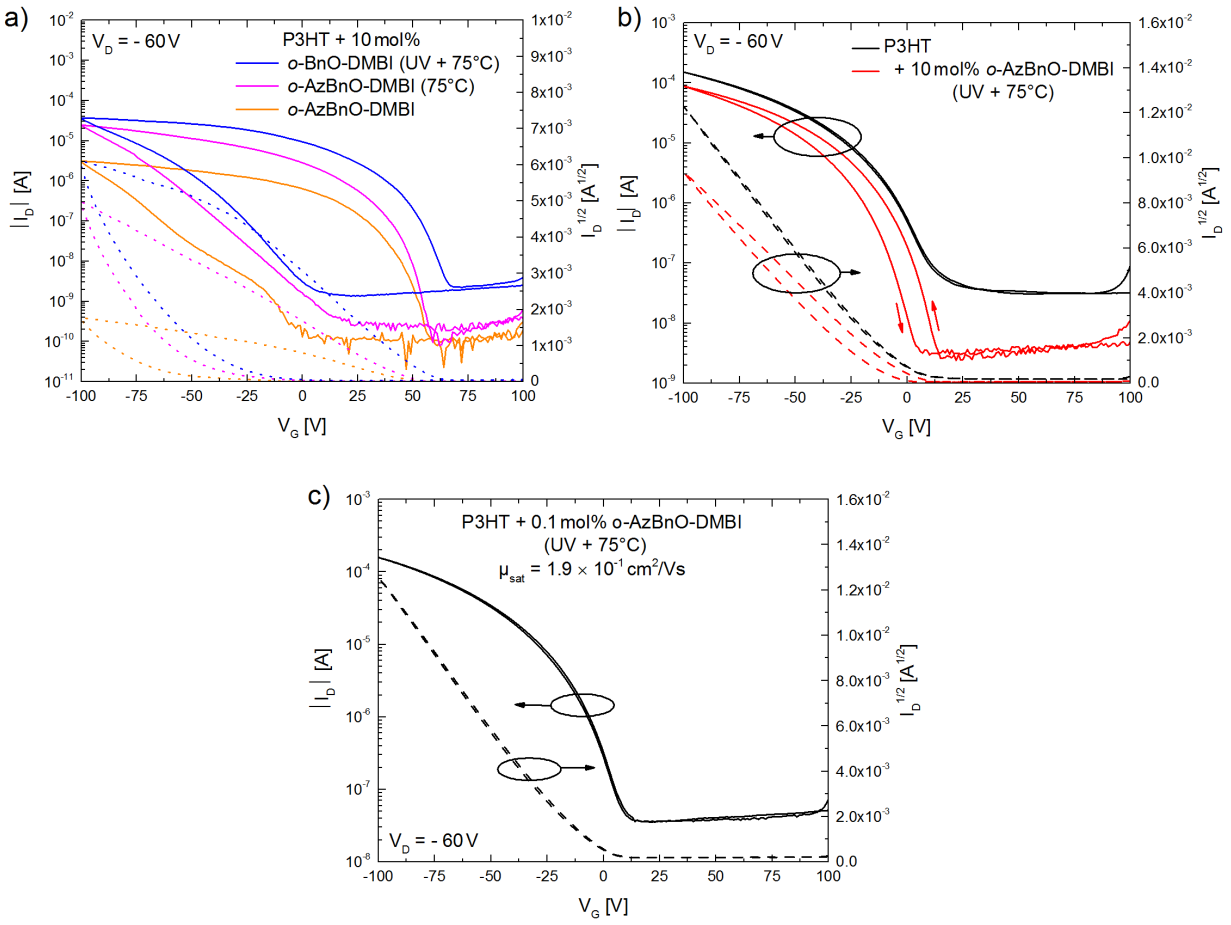

Figure S7. Transfer curves of OFETs measured from gate voltages between 100 V and -100 V in air. a) Devices with not immobilized n-dopants show even stronger hysteresis for the extended measurement range. b) Also devices with 10 mol% of immobilized o-AzBnO-DMBI show little hysteresis for the extended measurement range. c) Transistors with 0.1 mol% in contrast do not show any hysteresis and lead to highest field-effect mobilities.

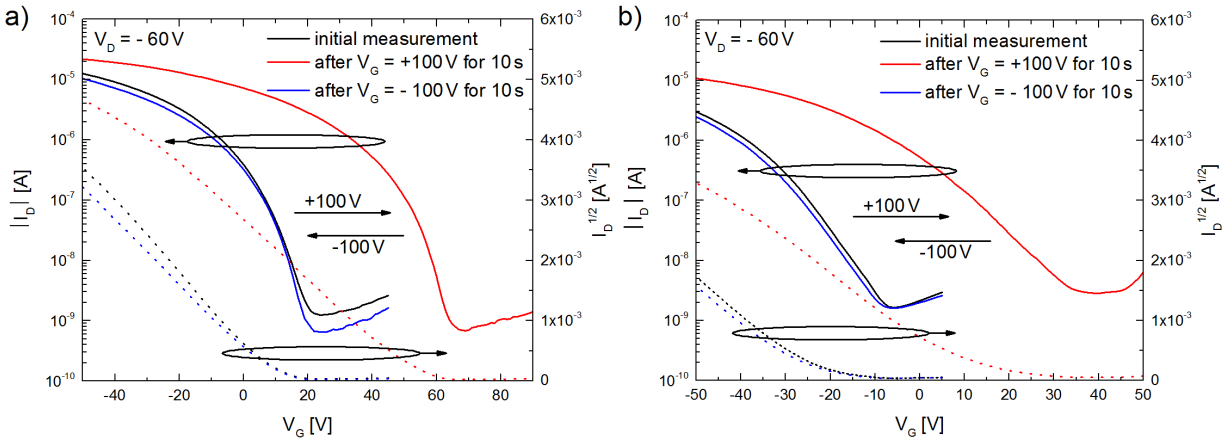

Figure S8. Memristive Transistors with mobile n-dopants. a) Through applying 100 V for 10 s the threshold voltage of devices with 10 mol% o-BnO-DMBI treated with UV for 15 minutes and 75°C for one hour can reversibly be shifted. b) The same goes for devices with 10 mol% o-AzBnO-DMBI without any treatment.

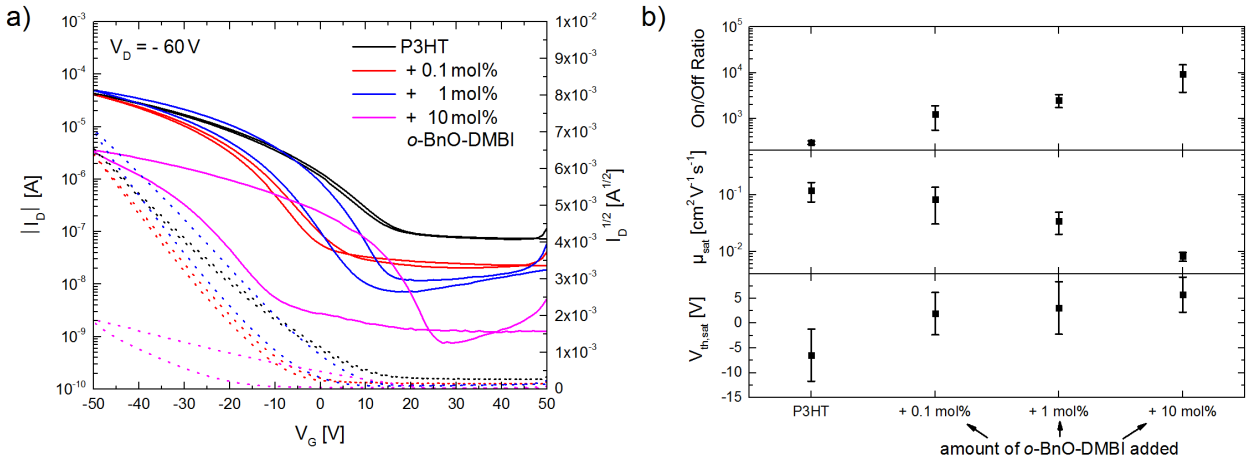

Figure S9. OFETs with increasing *o*-BnO-DMBI-content. a) Increasing *o*-BnO-DMBI content reduces off-currents, but also increases hysteresis in device operation. b) This reflects in increasing threshold voltages for measuring in the forward direction. Also field-effect mobilities continuously decrease, while on/off-ratios increase due to compensation doping by the n-dopant.

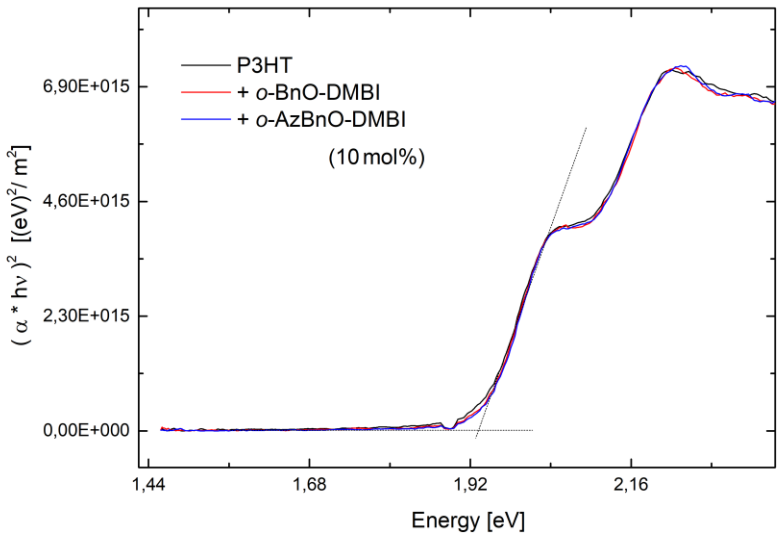

Figure S10. Tauc-plot from UV-Vis-spectra of P3HT and DMBI-doped P3HT films on quartz-glass of Figure S2.

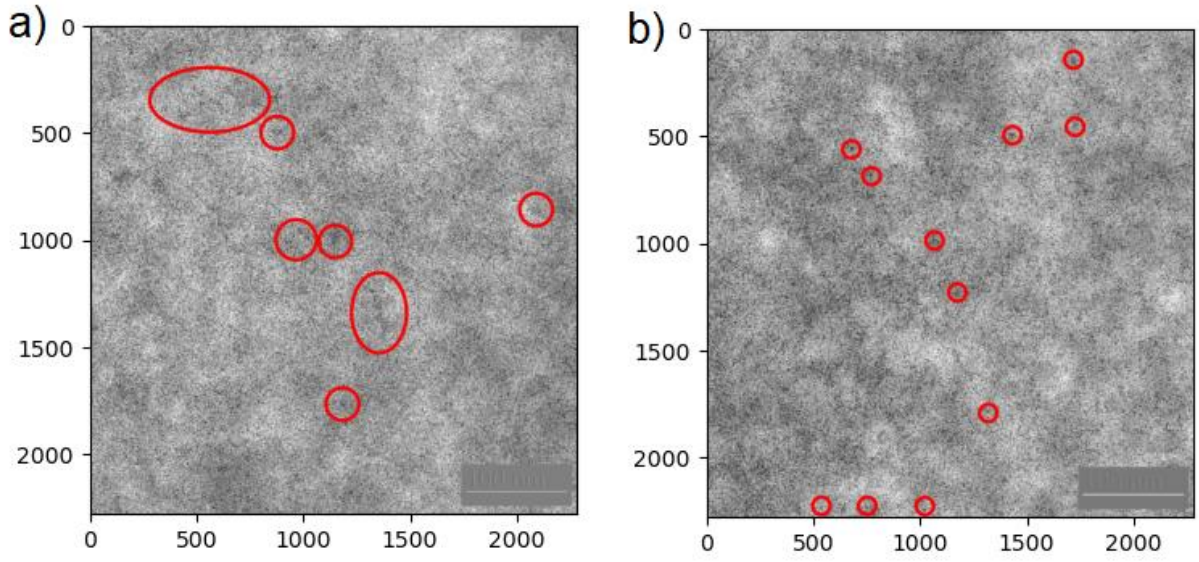

Figure S11. Differential Images of Figure 2c,d in (a) and of Figure 2f,g in (b) from the main article. Films of o-BnO-DMBI (a) and o-AzBnO-DMBI (b) in P3HT at the nanoscale. The red circles match those in Figure 2. They are not supposed to mark all clusters but highlight some regions of interest that fade after prolonged exposure (not shown here).