Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C

Supporting Information for

All-brush-painted top-gate organic thin-film transistors

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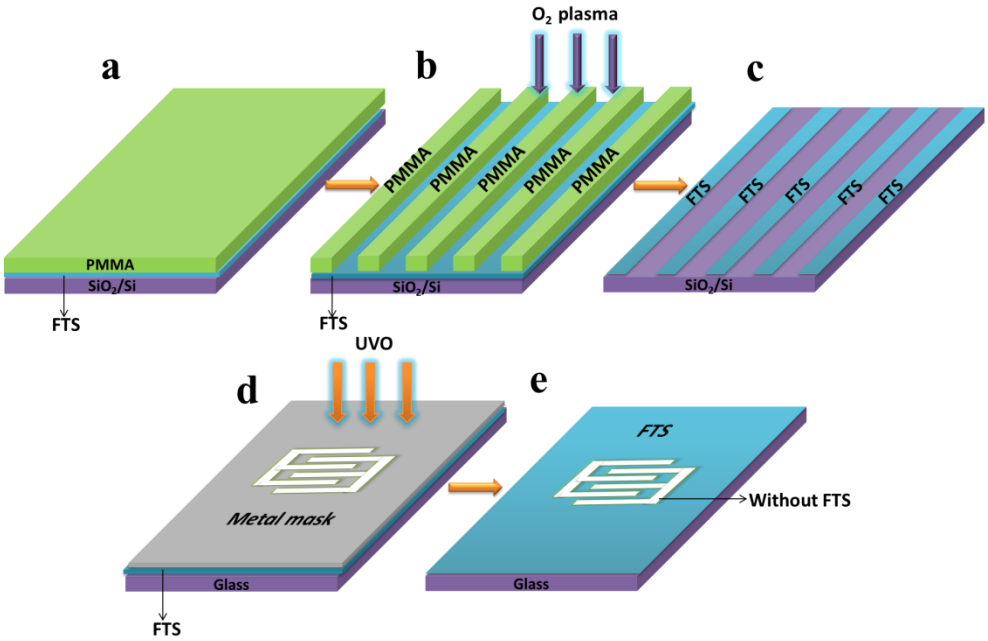
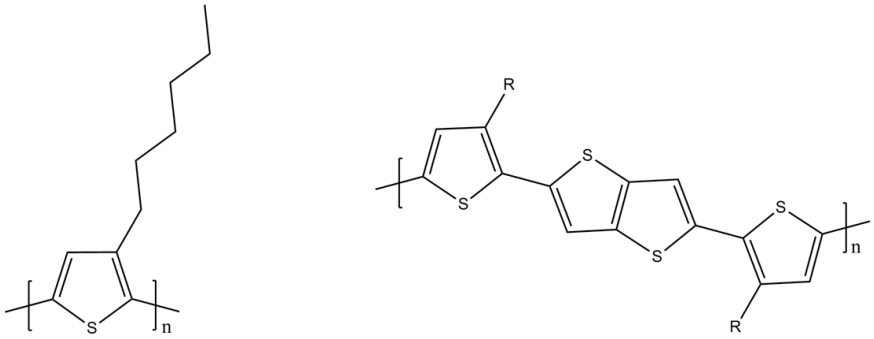


Fig. S1 Schematic of FTS patterning process by using a-c) PMMA film and d-e) metal mask as the pattern model. a) Deposition of PMMA layer on FTS modified substrate, b) patterning PMMA followed by the O_2 plasma treatment and c) SiO_2/Si substrate with patterned FTS. d) Covering metal mask on the FTS modified substrate followed by the UVO treatment and e) glass substrate with patterned FTS.



P3HT PBTTT

Fig. S2 Chemical structure of poly(3-hexylthiophene) (P3HT) and poly(2,5-bis(3-alkylthiophen-2-yl)thieno[3,2-*b*]thiophene) (PBTTT).

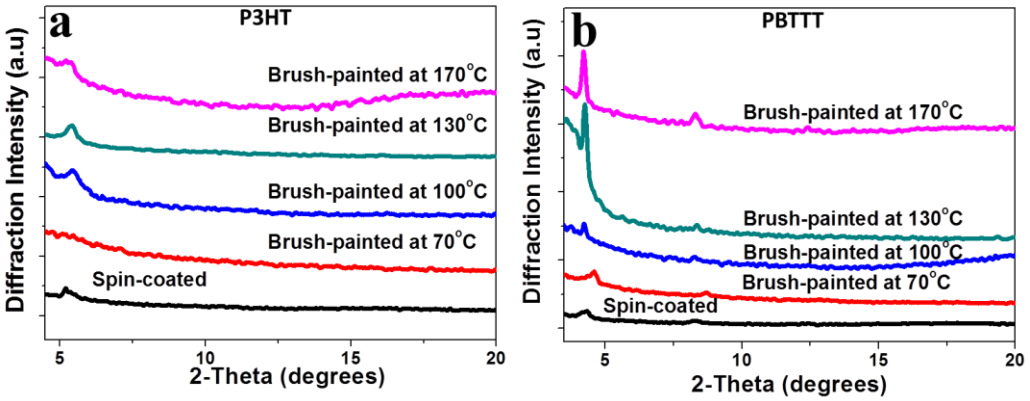


Fig. S3 The XRD spectra of thin film based on P3HT and PBTTT, prepared by spin coating and brush painting at different temperatures and followed by annealing treatment at 100 ^{o}C for P3HT and 170 ^{o}C for PBTTT.

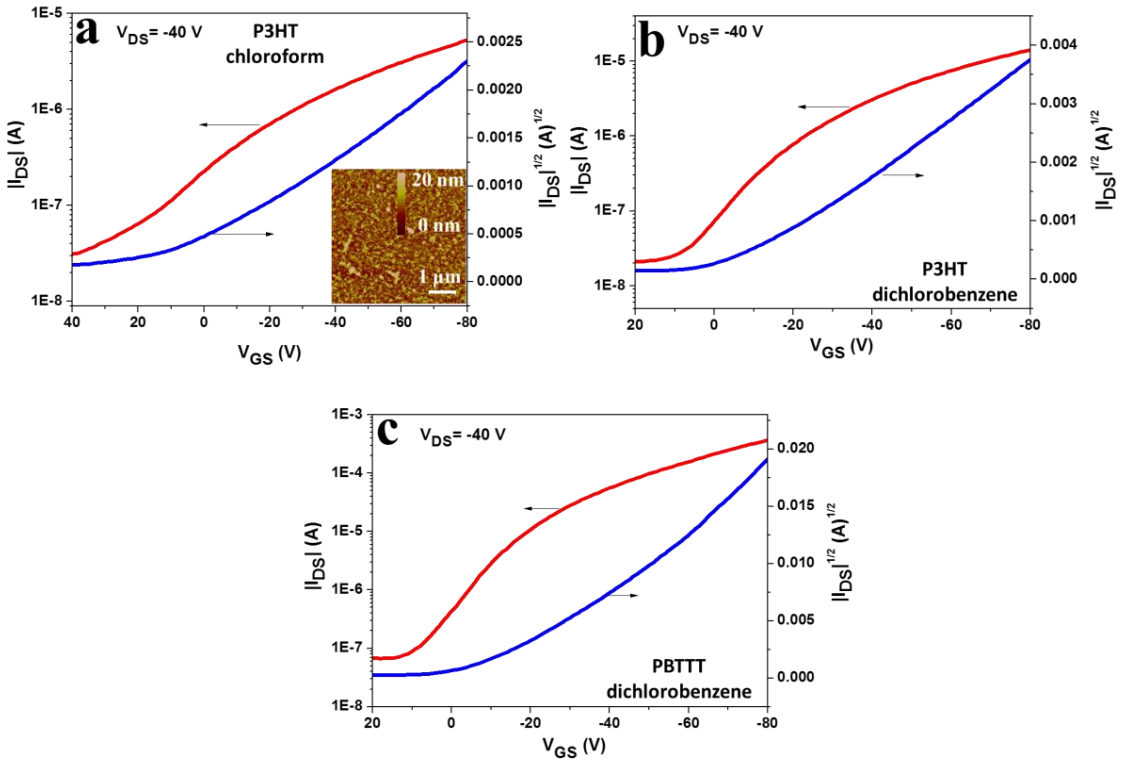


Fig. S4 Transfer characteristics of OTFTs with brush painted a) P3HT dissolved in chloroform, b) in chlorobenzene and c) PBTTT dissolved in dichlorobenzene utilizing pre-patterned Au as source-drain electrodes, spin-coated PMMA as dielectric film, and evaporated silver as gate electrode.(a: W=2800 μm, L=30 μm; b: W=2800 μm, L=40 μm; c: W=2800 μm, L=10 μm)

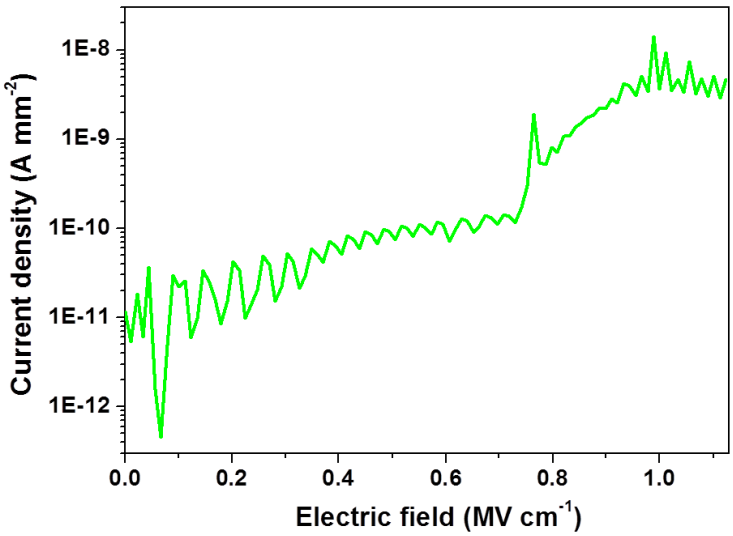


Fig. S5 Leak current test of two-terminal device with structure of ITO/PMMA/Ag.

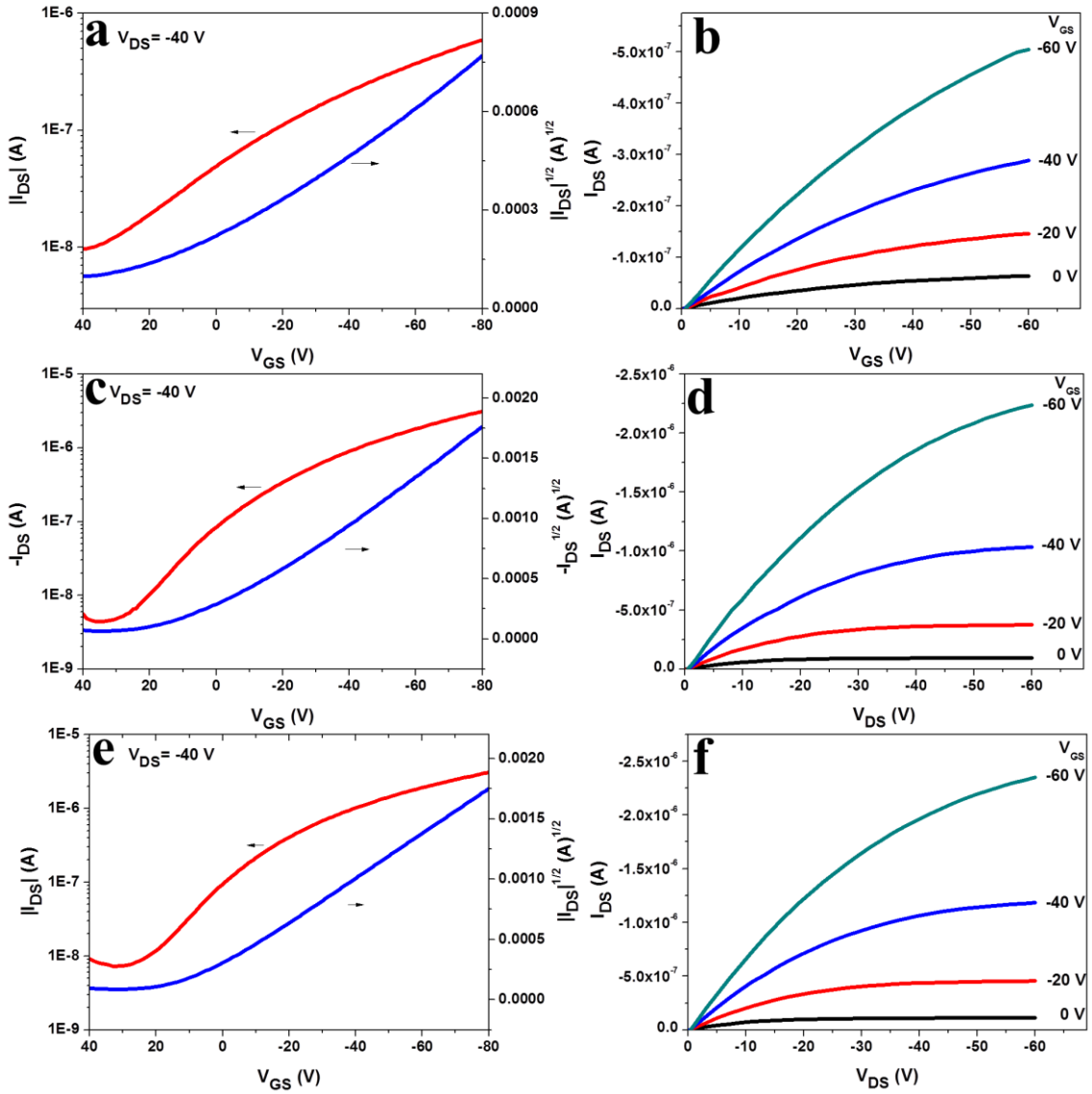


Fig. S6 Transfer and output characteristics of P3HT based all-brush-painted devices at different substrate temperatures of a-b) 70 ^{o}C, c-d) 100 ^{o}C, and e-f) 170 ^{o}C.(W=4200 µm, L=100 µm)

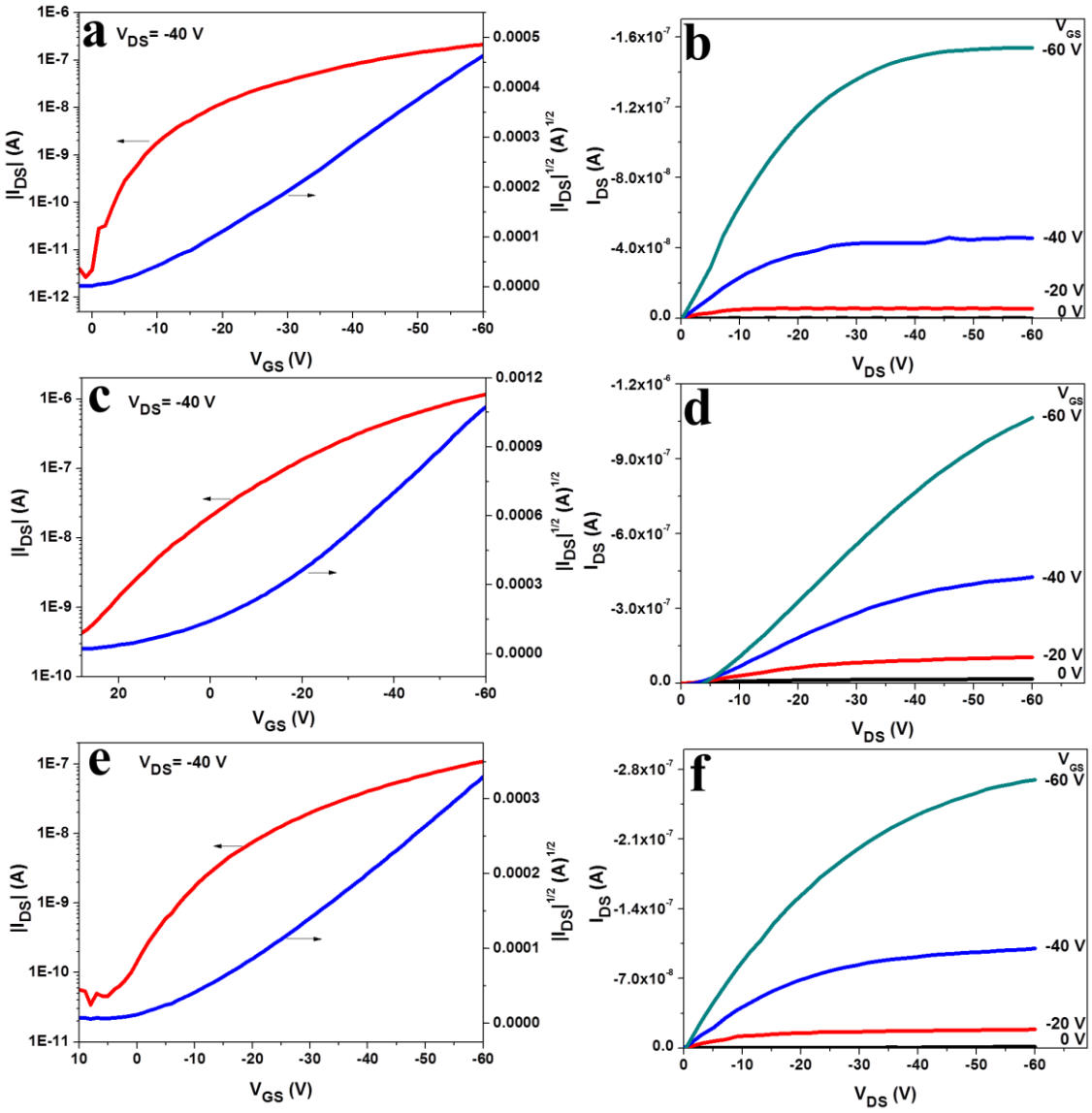


Fig. S7 Transfer and output characteristics of PBTTT based all-brush-painted devices at different substrate temperatures of a-b) 70 ^{o}C, c-d) 100 ^{o}C, and e-f) 170 ^{o}C.(a,b: W=2800 µm, L=80 µm; c,d: W=1800 µm, L=100 µm; e,f: W=2000 µm, L=60 µm)

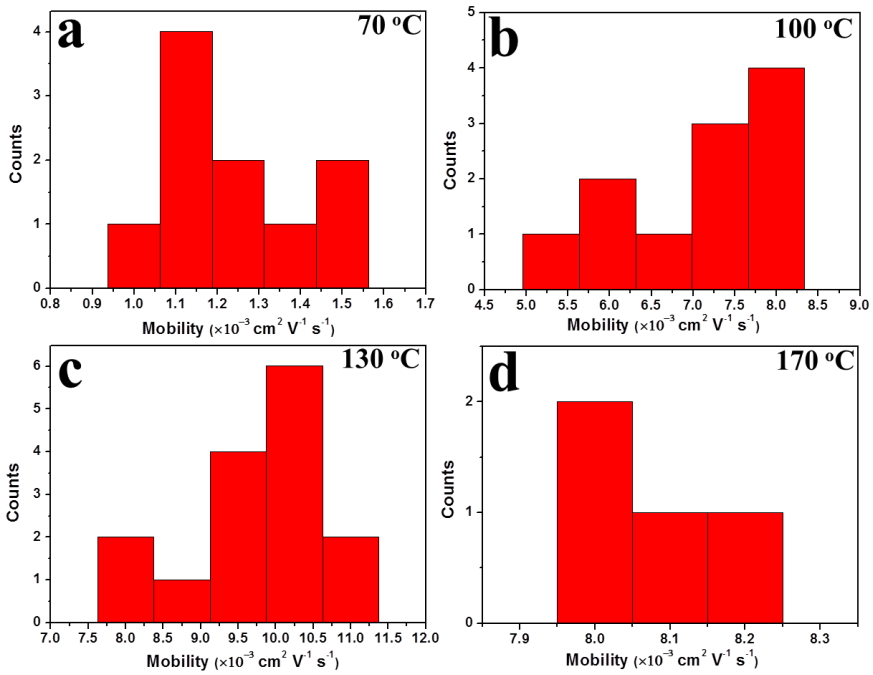


Fig. S8 Statistical histograms of field-effect mobility for P3HT based OTFTs brush painted at a) 70 °C, b) 100 °C, c) 130 °C and d) 170 °C.

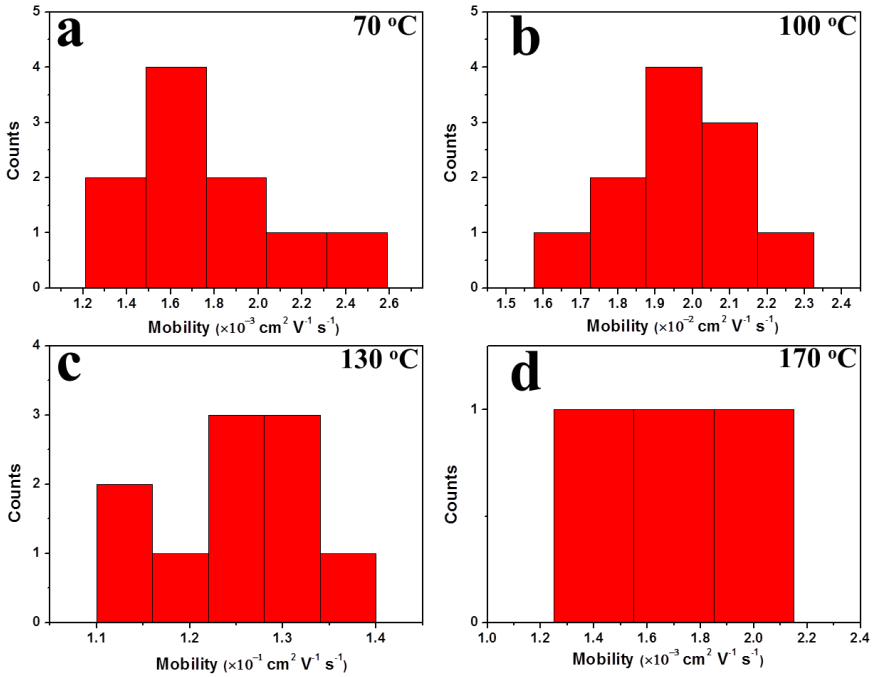


Fig. S9 Statistical histograms of field-effect mobility for PBTTT based OTFTs brush painted at a) 70 °C, b) 100 °C, c) 130 °C and d) 170 °C.

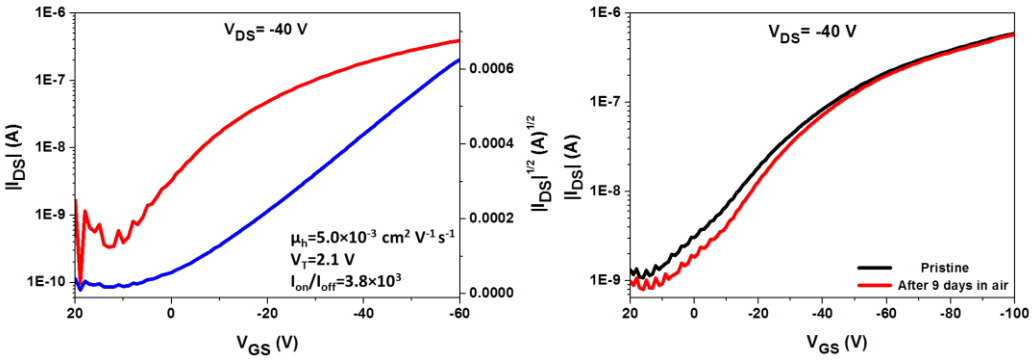


Fig. S10 a) Transfer characteristics of P3HT based devices with all functional layers deposited by brush painting in ambient conditions. b) Transfer curve of a P3HT based device before (black) and after (red) storage for 9 days in air. (a: W=3000 μm, L=140 μm)