

Supporting Information

External electric field treatment for improving morphology and electrical performance of P(NDI2OD-T2)

Yina Moon,^a Yunseul Kim,^{a,b} Dongseong Yang,^a Nara Han,^a Minwoo Lee,^a Younghyo Kim,^a Il-young Jo,^a Myung-Han Yoon,^a and Dong-Yu Kim^{a}*

^a School of Materials Science and Engineering (SMSE)
Gwangju Institute of Science and Technology (GIST)
123 Cheomdangwagi-ro Buk-gu, Gwangju 61005, Republic of Korea
E-mail: kimdy@gist.ac.kr

^b Department of Chemistry, Chemistry Research Laboratory
University of Oxford
Oxford, UK

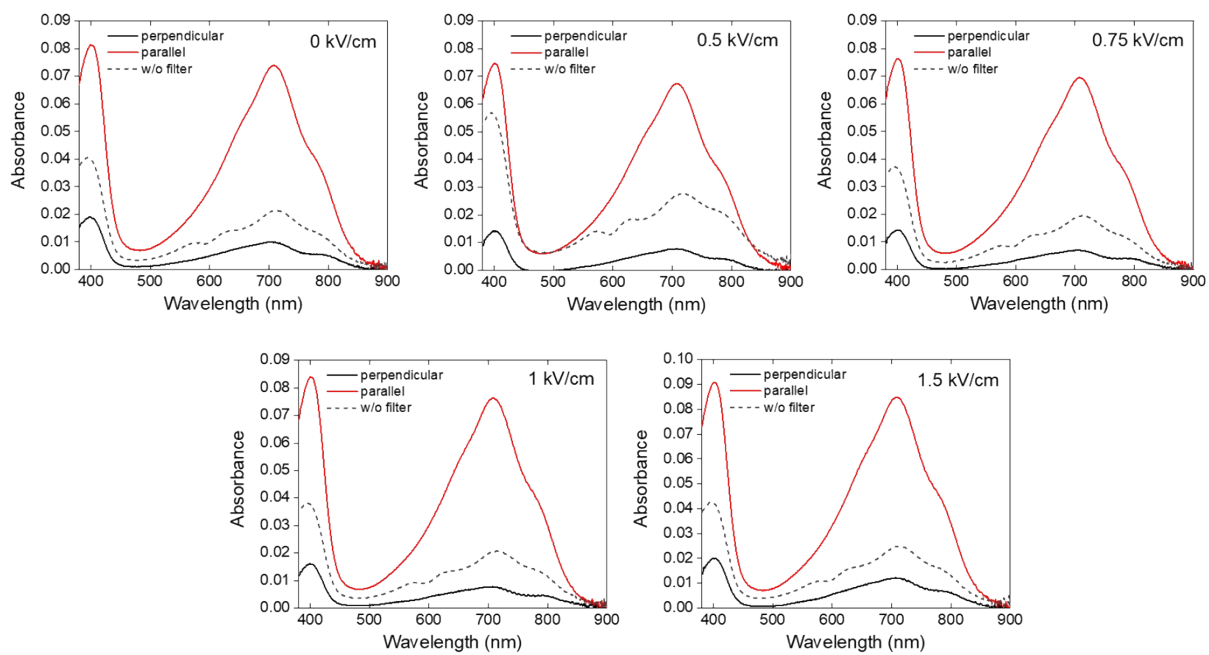


Figure S1. UV-vis absorption graphs with original light and parallel, perpendicular line-polarized lights according to external electric field (EEF) intensity

Table S1. Polarized UV-vis absorbance data: peak area values, order parameters extracted by the main absorption peak depending on the external electric field (EEF) intensities

External electric field (kV/cm)	0	0.5	0.75	1	1.5
Parallel ($A_{//}$)	12.72	11.63	11.90	13.05	14.52
Peak area					
Perpendicular (A_{\perp})	1.87	1.29	1.31	1.53	2.21
Calculated order parameter	0.66	0.73	0.73	0.71	0.65

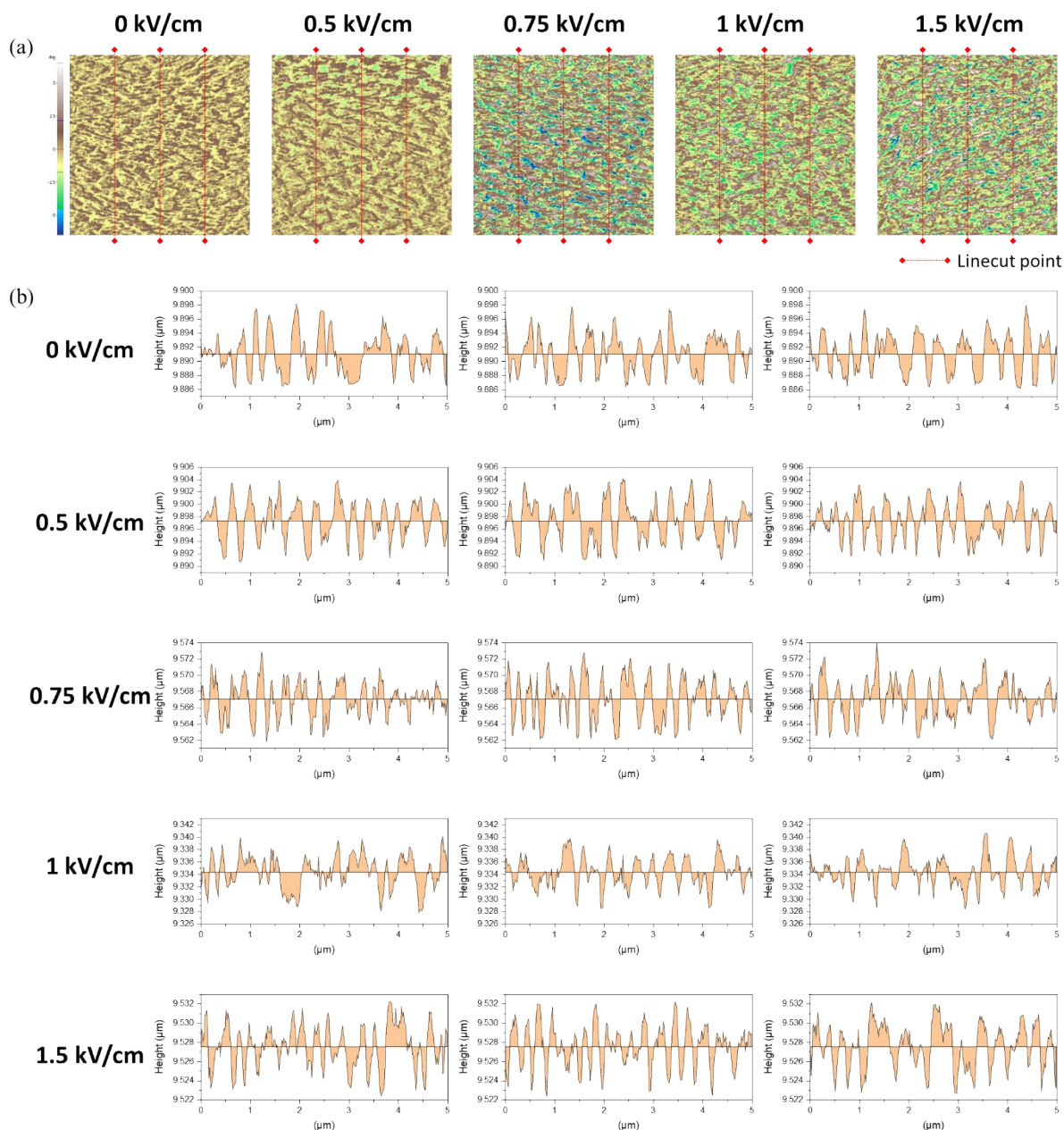


Figure S2. (a) AFM phase images, (b) vertical linecuts at 64, 128, 192 pixels in the x-axis

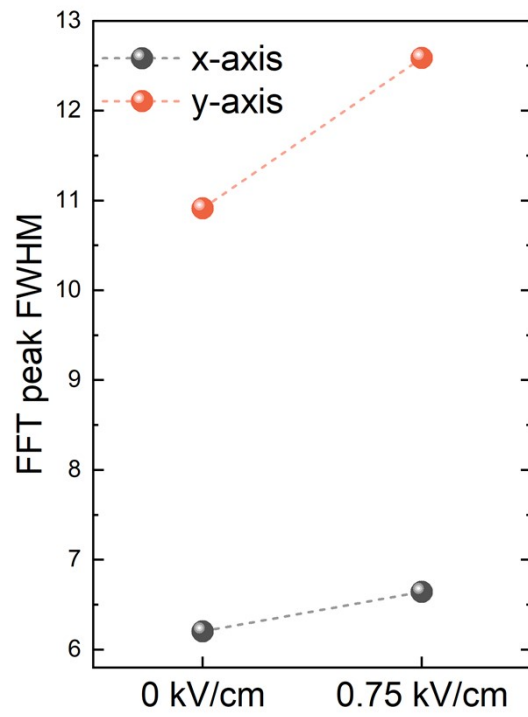


Figure S3. FWHM trend in the x- and y-axis direction of the FFT analysis peak

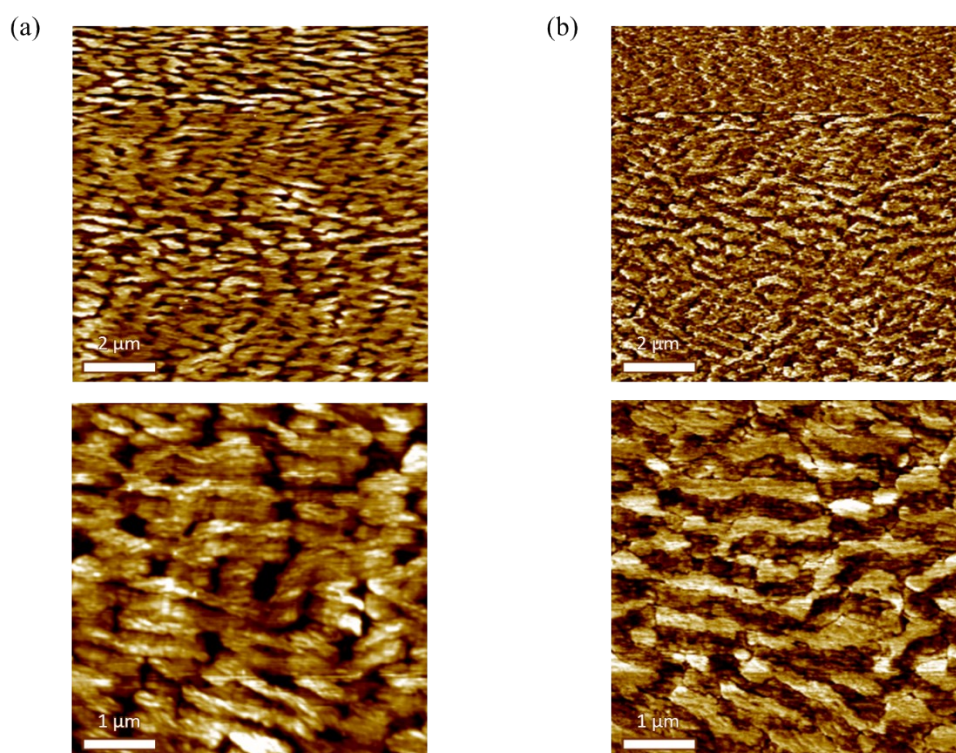


Figure S4. (a) AFM height images and (b) phase images with EEF treatment at the intensity of 2 kV/cm

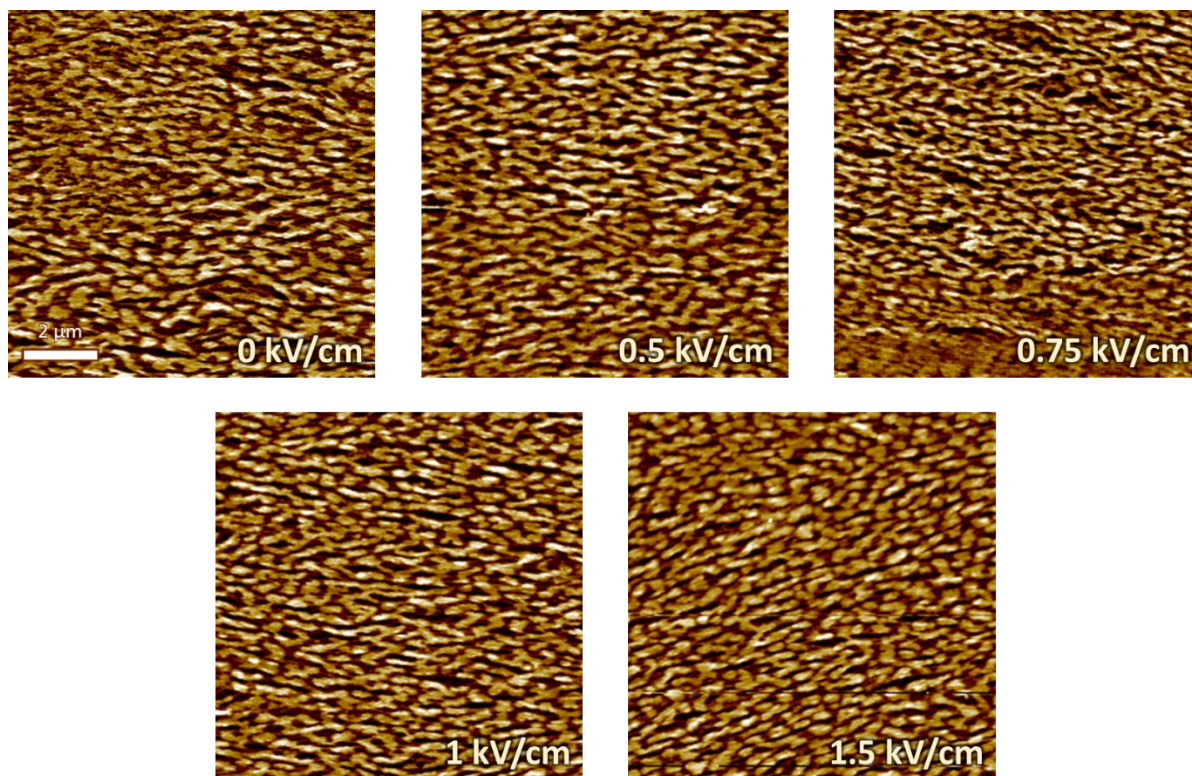


Figure S5. AFM height images in $10 \times 10 \mu\text{m}$ area

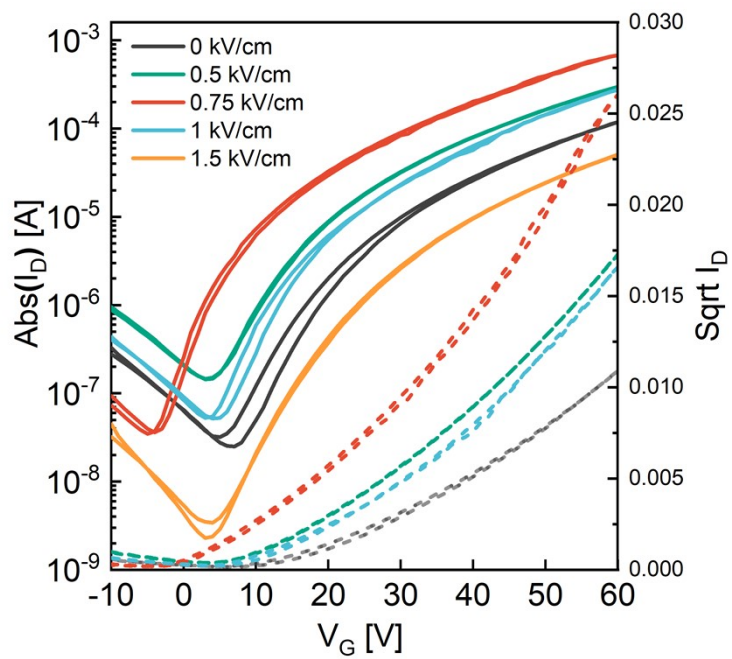


Figure S6. Transfer curves of OFETs according to EEF intensity

Table S2. Electrical performance depending on the EEF intensity extracted by operating OFETs

External electric field (kV/cm)		0	0.5	0.75	1	1.5
Electron mobility [μ_e] (cm^2/Vs)	Average	1.69	1.68	2.14	1.58	1.20
	Maximum	2.61	2.63	3.33	2.26	1.94
Threshold voltage [V_{Th}] (V)		18.0	21.2	19.0	18.4	22.4
Contact resistance [R_{C}] at V_{Th} (Ω)		2.77E+07	2.33E+06	9.60E+05	6.67E+06	3.78E+07

Table S3. Summary of the reported electrical performance of OFETs based on P(NDI2OD-T2) up to the present date

Year	Max. electron mobility [$\mu_{e,max}$] (cm ² /Vs)	Threshold voltage [V_{Th}] (V)	I_{on}/I_{off}	Literature
2011	0.3		10 ⁷	63
2012	0.96	~30	10 ⁷	65
2014	0.14	15	10 ⁴	62
2014	0.23		10 ³	70
2015	1.28	3.95	10 ⁴	61
2016	1.22	41.66	10 ⁵	69
2017	0.061	50	10 ⁶	64
2018	1.47	5	10 ⁵	66
2019	3.99	15.22	10 ⁴	71
2020	2.78	23.16	10 ⁴	59
2021	0.069	55	10 ³	60
2021	2.56			68
2023	0.78	25	10 ⁶	67
2023	3.33	19	10 ⁴	This work

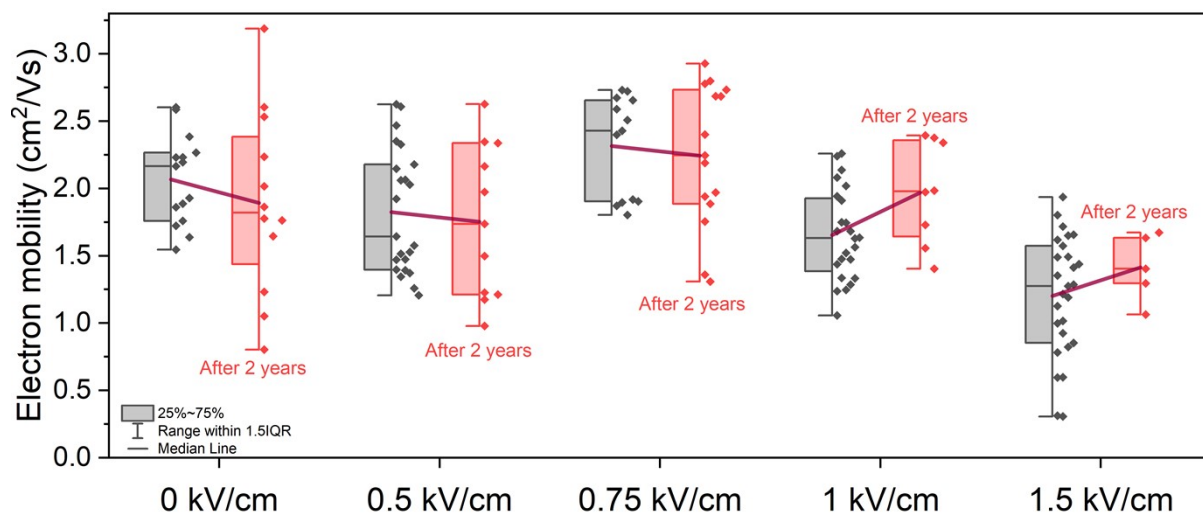


Figure S7. Electron mobility distribution of OFET measured before and after a 2-year period, comparing samples treated with 0 kV/cm and 0.75 kV/cm

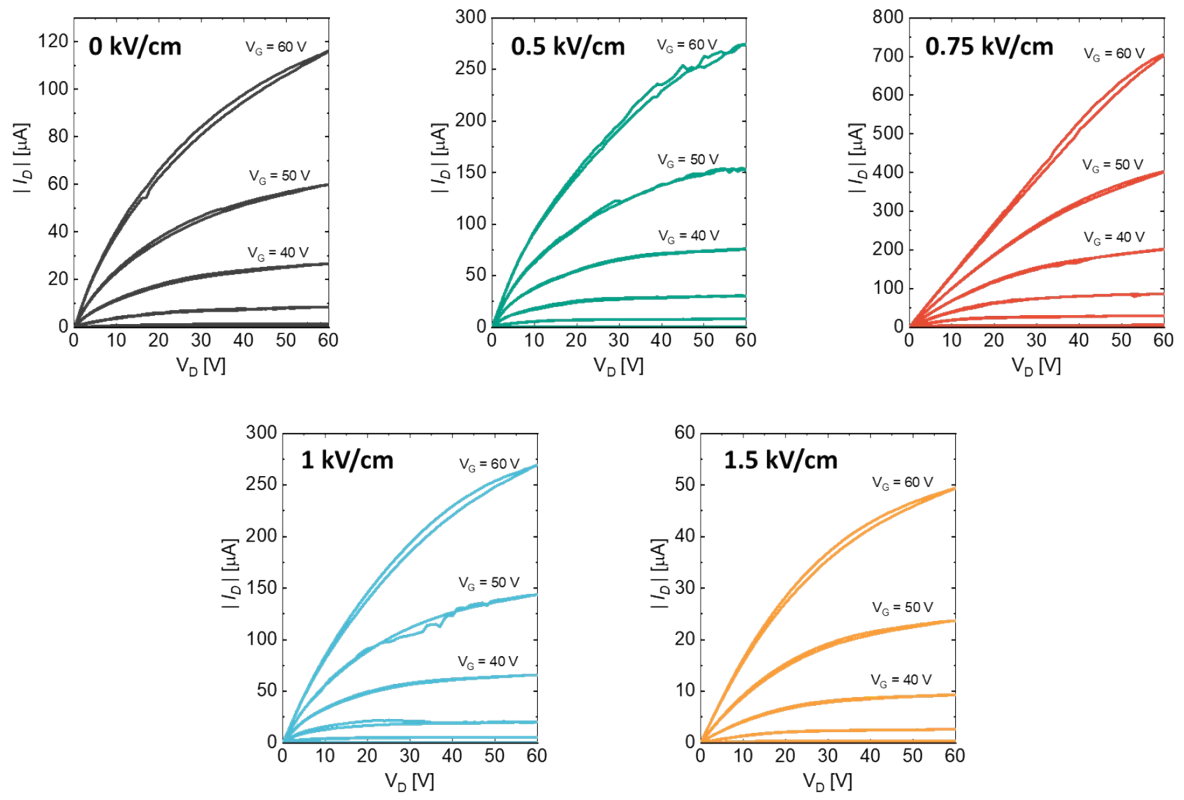


Figure S8. Output curve of OFETs according to EEF intensity

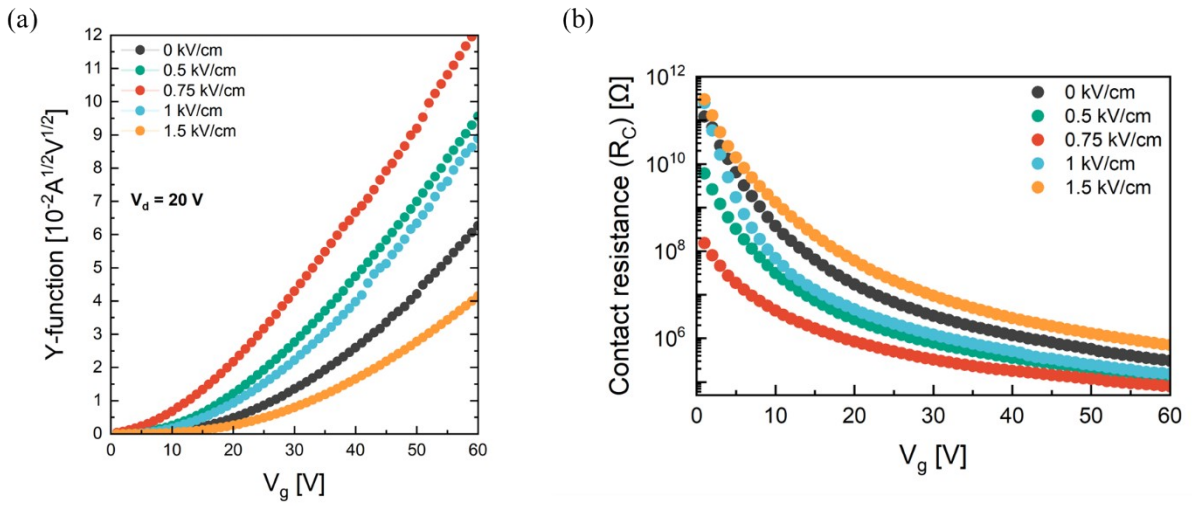


Figure S9. (a) Y-function and (b) contact resistance depending on the gate voltages with or without various EEF treatment