Electronic Supplementary Information

Ladder-Like Polysilsesquioxane Dielectrics for Organic Field-Effect Transistor Applications

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†M. P. and A. S. L. contributed equally.

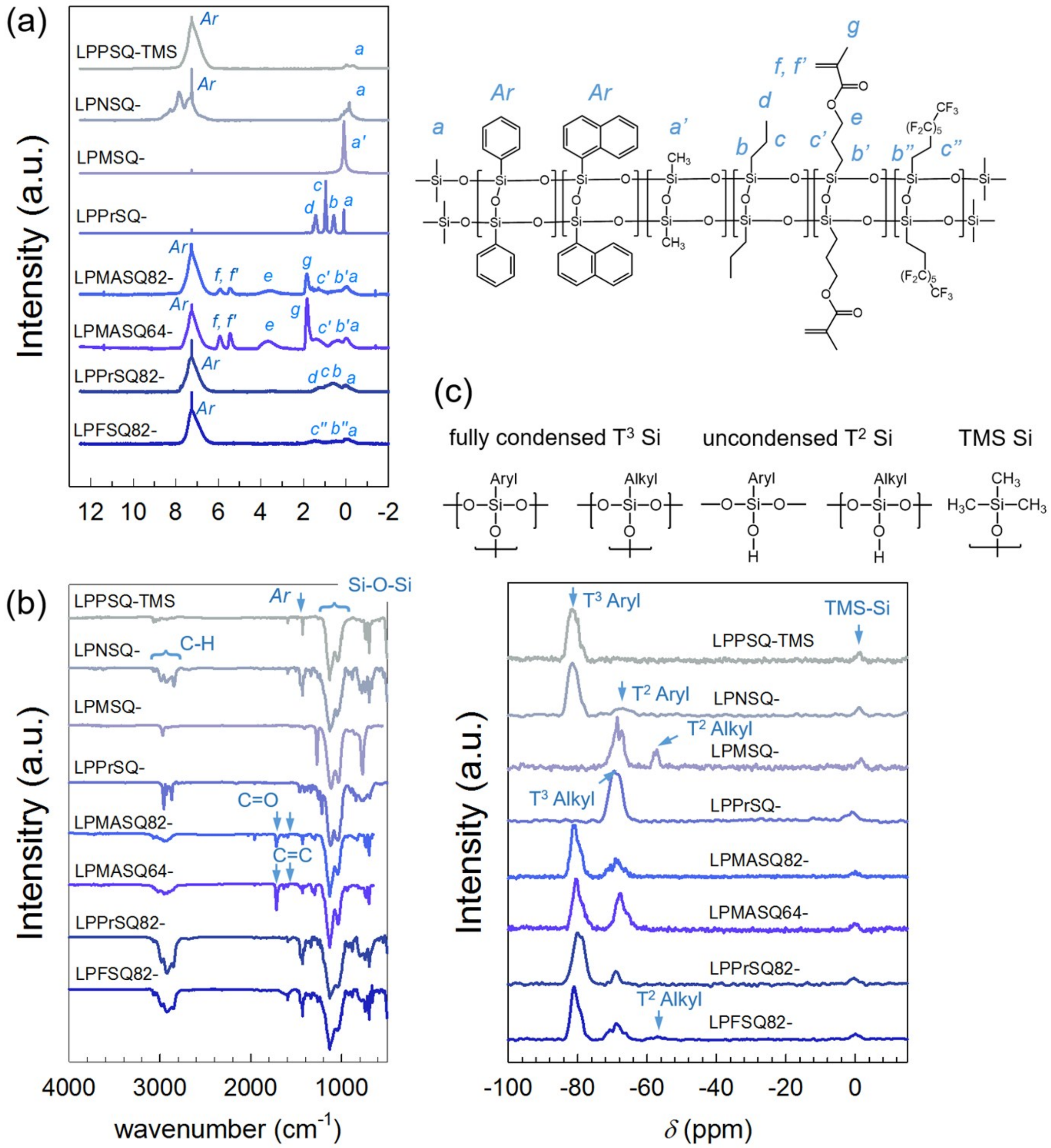


Fig. S1 (a) ^{1}H NMR, (b) FT-IR, and (c) ^{29}Si NMR spectra of LPSQ-TMS series studied in this paper.

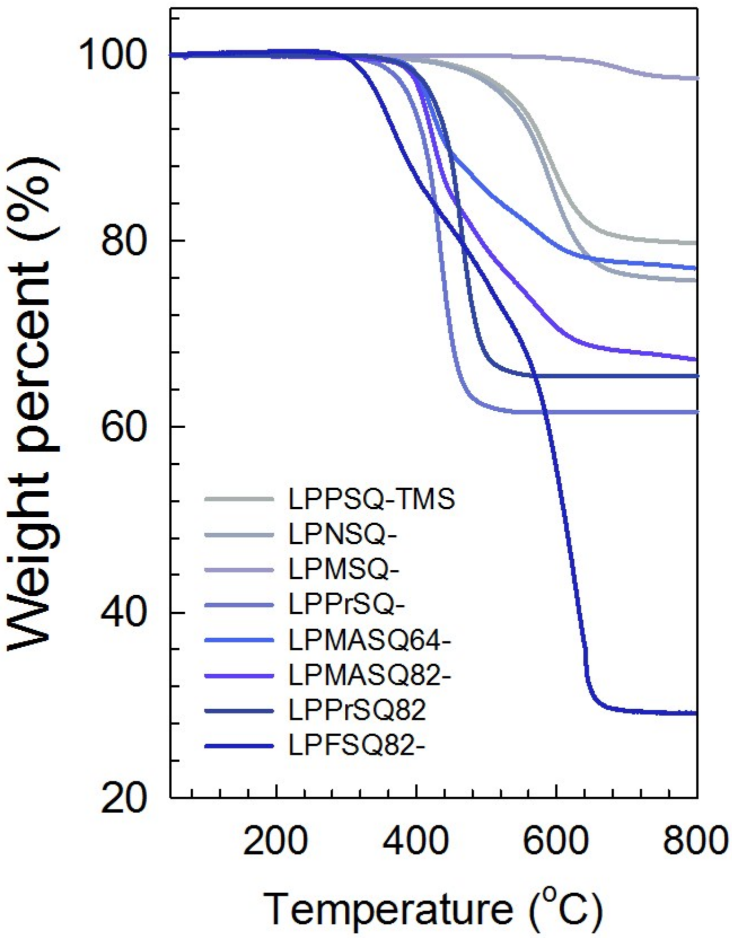


Fig. S2 TGA profiles of LPSQ-TMS series studied in this work.

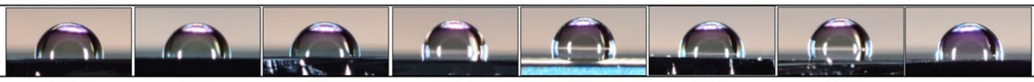
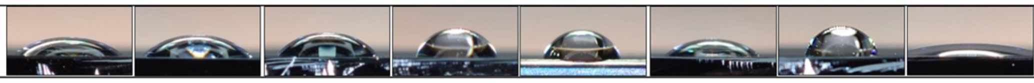
	LPSQ-TMS treated SiO_2								untreated SiO_2
	LPPSQ-	LPM82-	LPM64-	LPMSQ-	LPPrSQ-	LPPrSQ82-	LPFSQ82-	LPNSQ-	
Liquid Contact									
H_2O									
θ_{H_2O} (°)	95.7	92.8	91.3	108.1	105.2	97.2	113.0	99.5	39.3
CH_2I_2									
$\theta_{CH_2I_2}$ (°)	37.5	45.5	53.9	75.2	71.7	40.3	81.4	(dissolved)	46.4
Surface energy (γ, mJ m^{-2})									
non-polar (γ^d)	41.9	36.2	30.2	19.9	21.6	40.7	16.9	N/A	24.0
polar (γ^p)	0.10	0.80	1.80	0.30	0.50	0.05	0.20	N/A	33.6
γ (= γ^d + γ^p)	42.0	37.0	32.0	20.2	22.1	40.75	17.1	N/A	57.6

Fig. S3 θ-based γ values of LPSQ-TMS treated and untreated SiO_2 dielectrics.

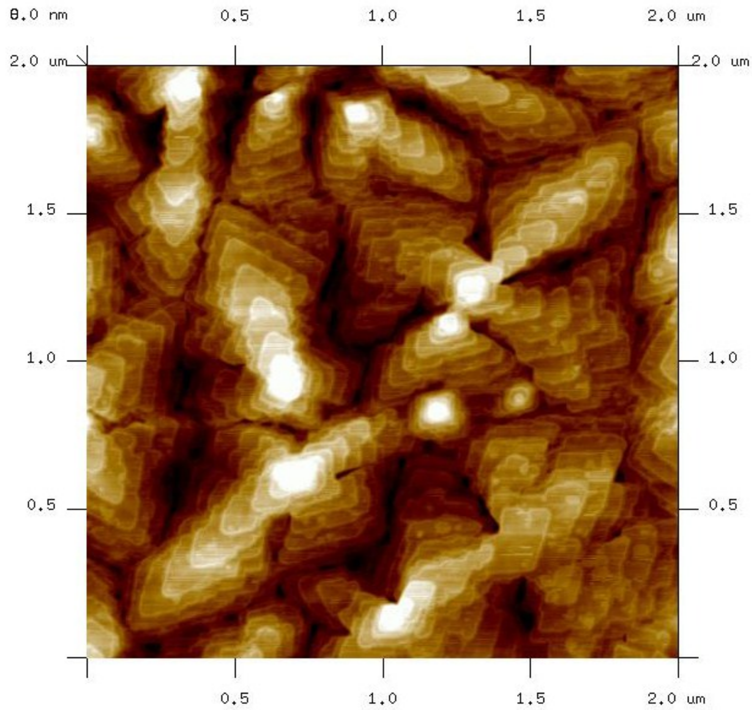


Fig. S4 AFM topography of 20 nm thick pentacene film on the LPMASQ82-TMS treated SiO_2 surface.

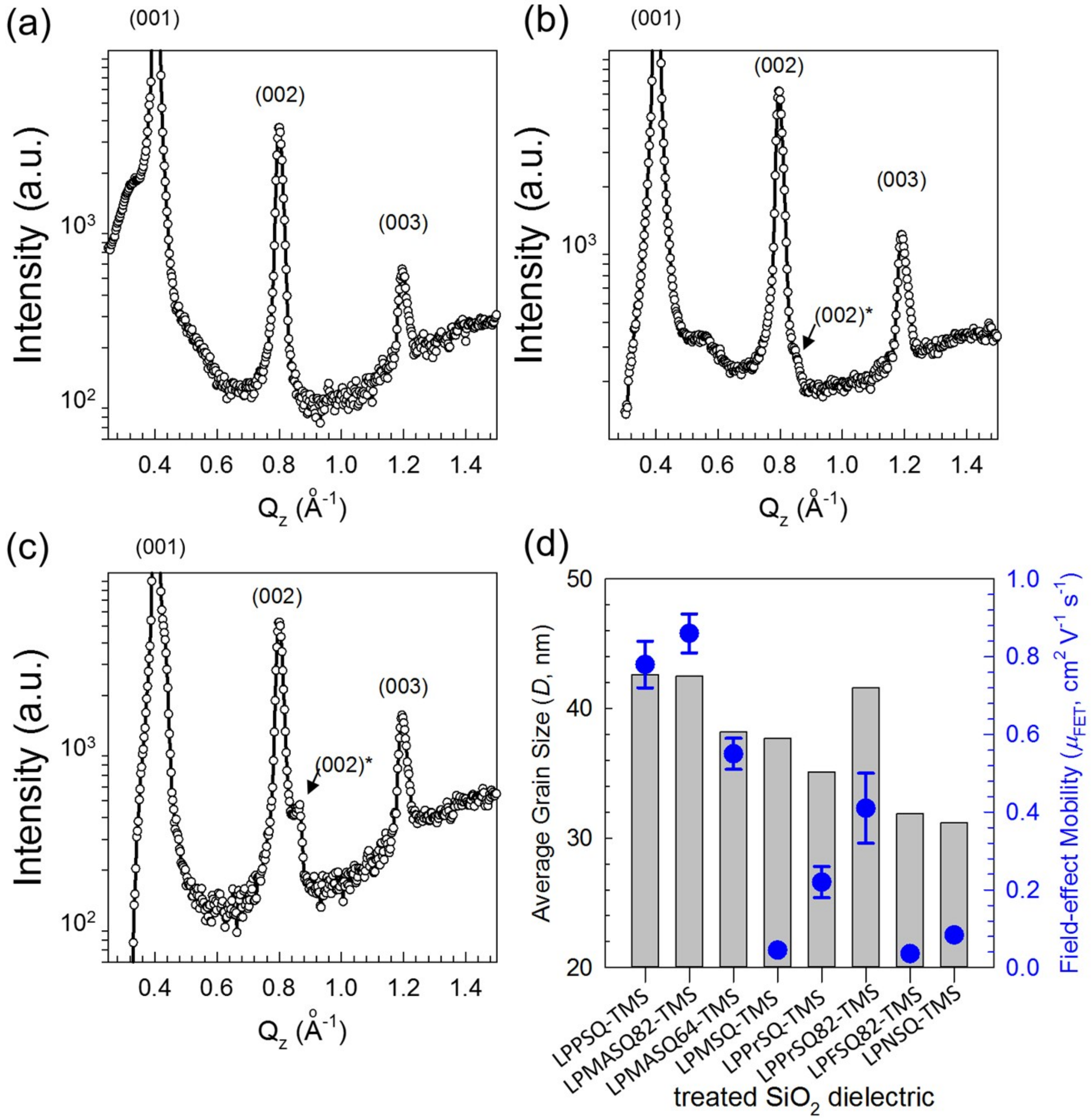


Fig. S5 (a–c) 1D out-of-plane X-ray diffraction profiles extracted along the Q_z axis from the 2D GIXD patterns of (a) LPMASQ82-, (b) LPPrSQ82-, (c) LPNSQ-TMS treated SiO_2 systems. (d) Variations in D and μ_{FET} of 50 nm thick pentacene films on the LPSQ-treated SiO_2 dielectrics.

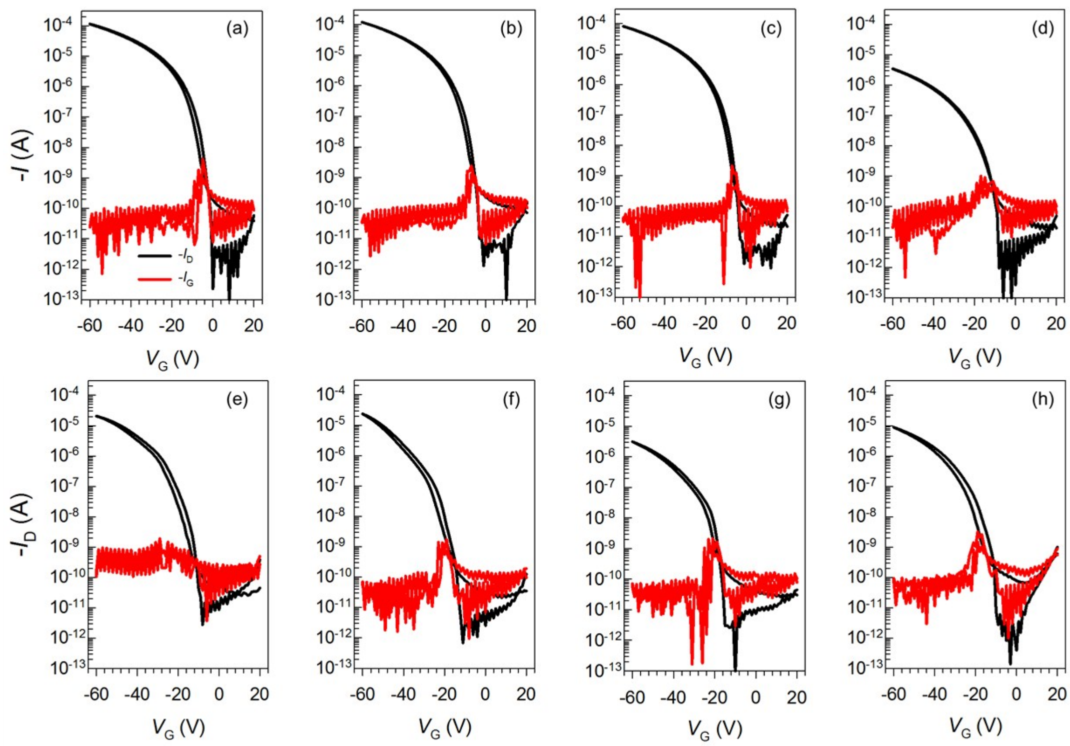


Fig. S6 Typical I_D–V_G transfer and I_G–V_G gate leakage curves of pentacene OFETs on the treated SiO_2 dielectrics including: (a) LPPSQ-, (b) LPMASQ82-, (c) LPMASQ64-, (d) LPMSQ-, (e) LPPrSQ-, (f) LPPrSQ82-, (g) LPFSQ-, and (h) LPNSQ-TMS layers.

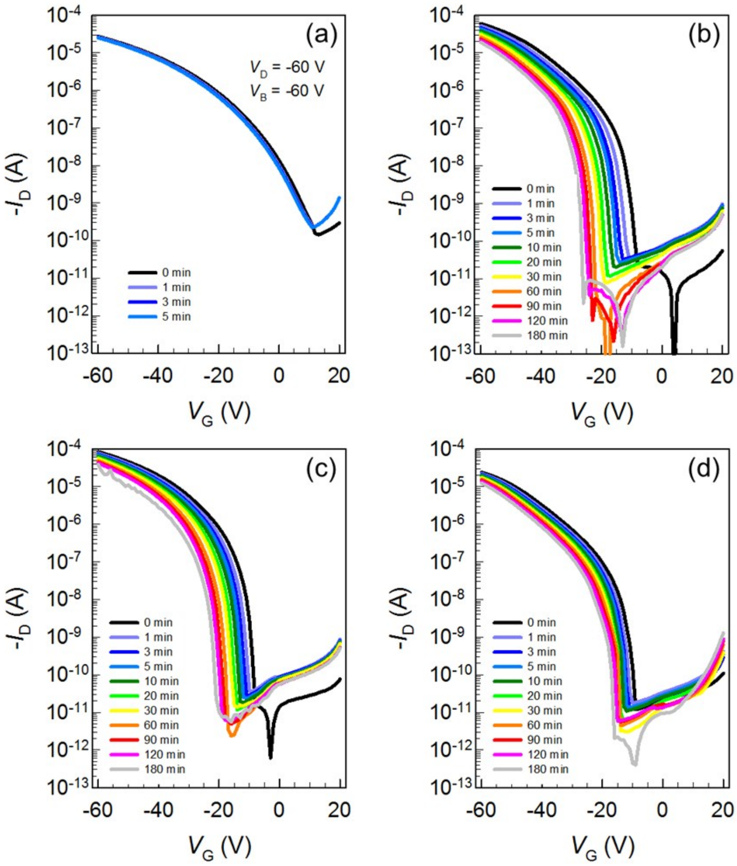


Fig. S7 I_D–V_G transfer curves of 50 nm pentacene OFETs on the (a) untreated and (b–d) LPSQ-TMS treated SiO_2 dielectrics including: (b) LPPSQ-, (c) LPMASQ82-, and (d) LPPrSQ82-, under a sustained gate bias of = -60 V as a function of stress time (*t*).

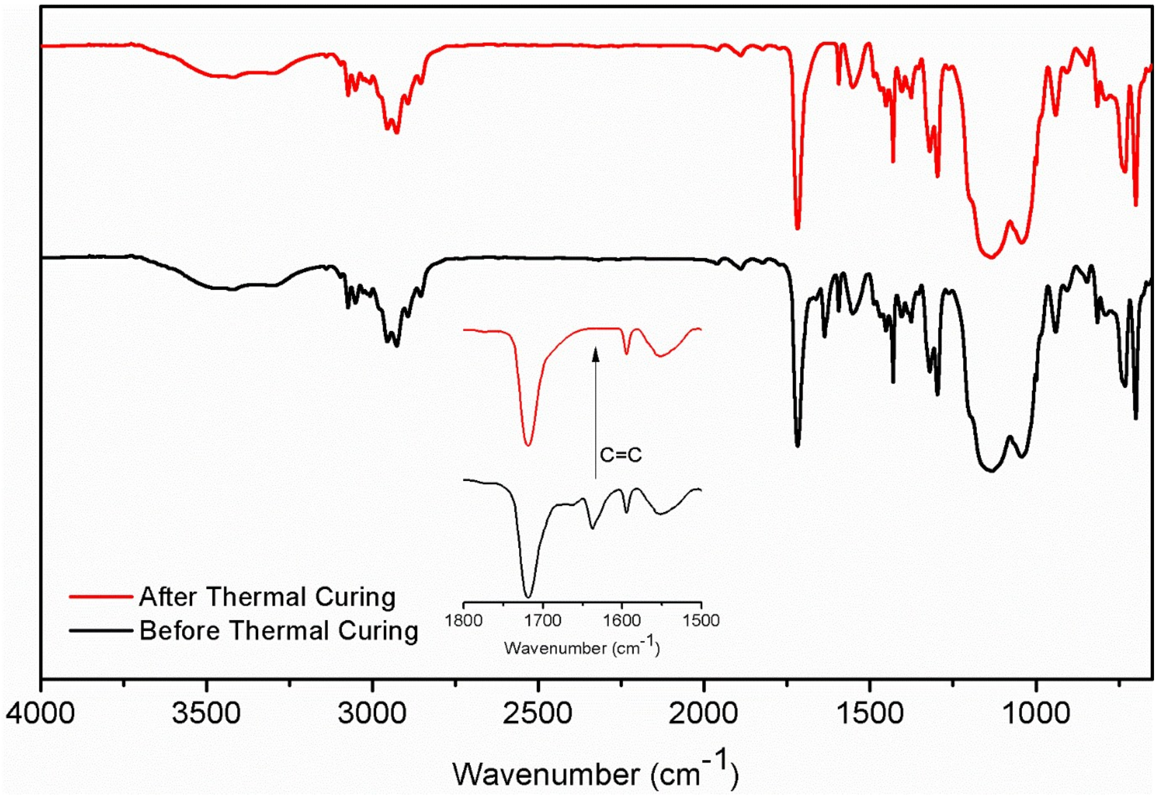


Fig. S8 FT-IR spectra of LPMASQ82-TMS/PMFM (95/5) before and after thermal curing.

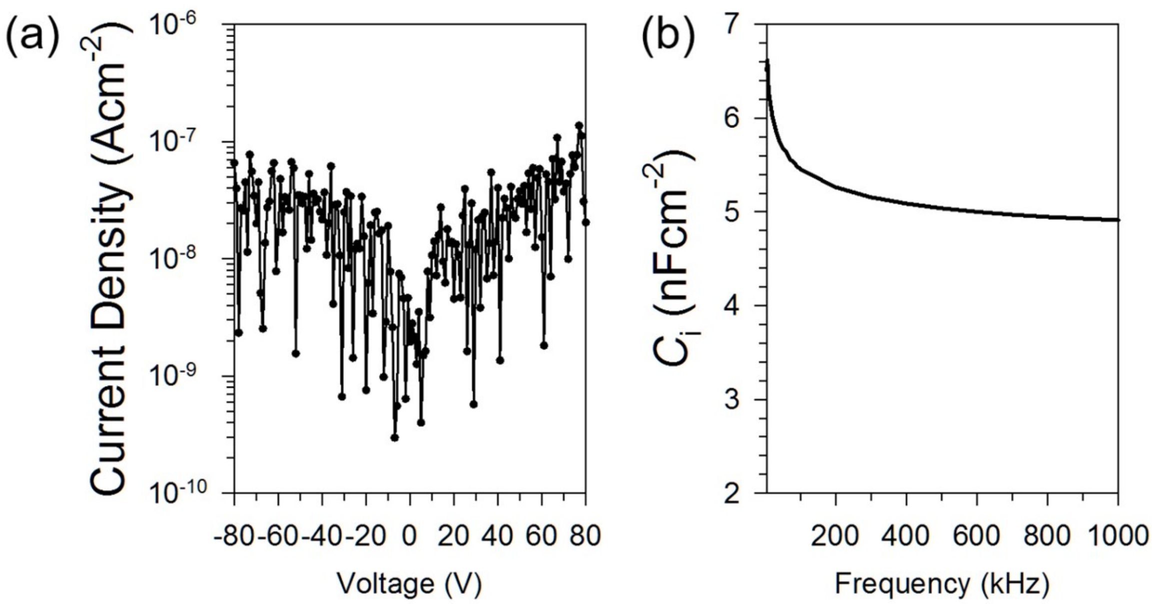
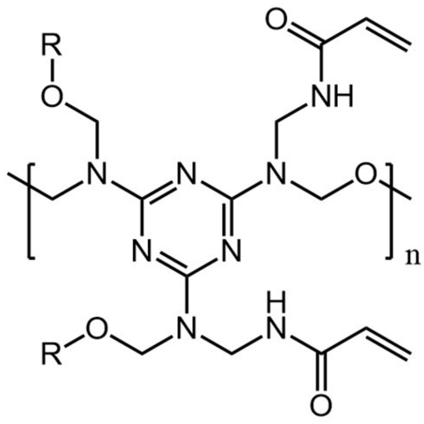


Fig. S9 (a) Current density and (b) C_i profile of 500 nm thick LPMASQ82-TMS film with ε_r of 2.77.



R = H, CH_3 or C_4H_9

Fig. S10 Chemical structure of poly(melamine-co-formaldehyde), acrylated.