ARTICLE

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Electrical and mechanical stability of flexible, organic electrolyte-gated transistors based on ion gel and hydrogels

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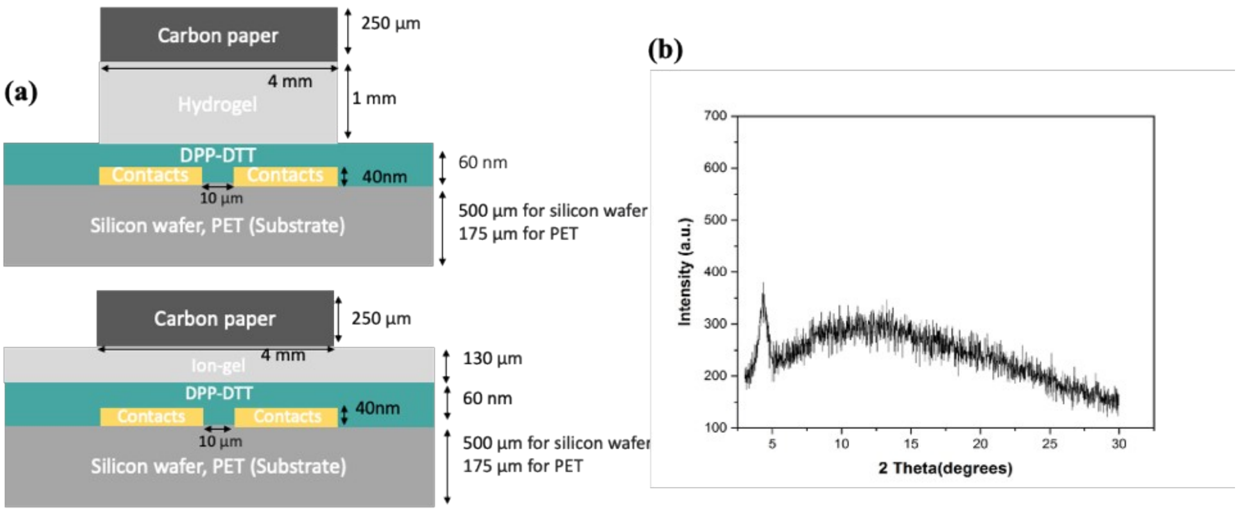

Figure S1. Side view of structure of EGTs (a) using hydrogel gating media (top) and ion-gel gating media (bottom), XRD Pattern of spin coated DPP-DTT film on Si/SiO_2 substrate (b).

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Table S1. Specific capacitance of reported MIM structures with different electrolytes.

Gel	MIM structure	Specific capacitance ($\mu F\ cm^{-2}$)	Ref
Biocampatible and biodegradable ionic gel ([CH][MA]:Levan[a])	Dry casting of gel on SUS stainless steel coin cell electrode (diameter: 20mm)	1.39 to 40.0 at 10 Hz	1
[EMIM][TFSI]:PVDF-HFP	ITO/Ion gel/ Al	8.39 (±0.38) (at 20 Hz)	2
[EMIM][TFSI]:PVDF-HFP	Au/Ion gel/Au	0.167 ± 0.03 - 4.16 ± 0.15 (at 1 KHz)	3
[EMIM][TFSI]: SEAS-N3[b]	Au/Ion gel/Au	24	4
[EMIM][TFSI]:PVDF-HFP	Au/Ion gel/Au	13.26 ± 1.26- 21.82 ± 0.92	5

a: [CH]: Choline bicarbonate, [MA]: malic acid, Levan: polysaccharide (matrix)
b: SEAS-N3: Poly[(styrene-r-vinylbenzyl azide)-b-poly(ethyl acrylate)-b-poly(styrene-r-vinylbenzyl azide)

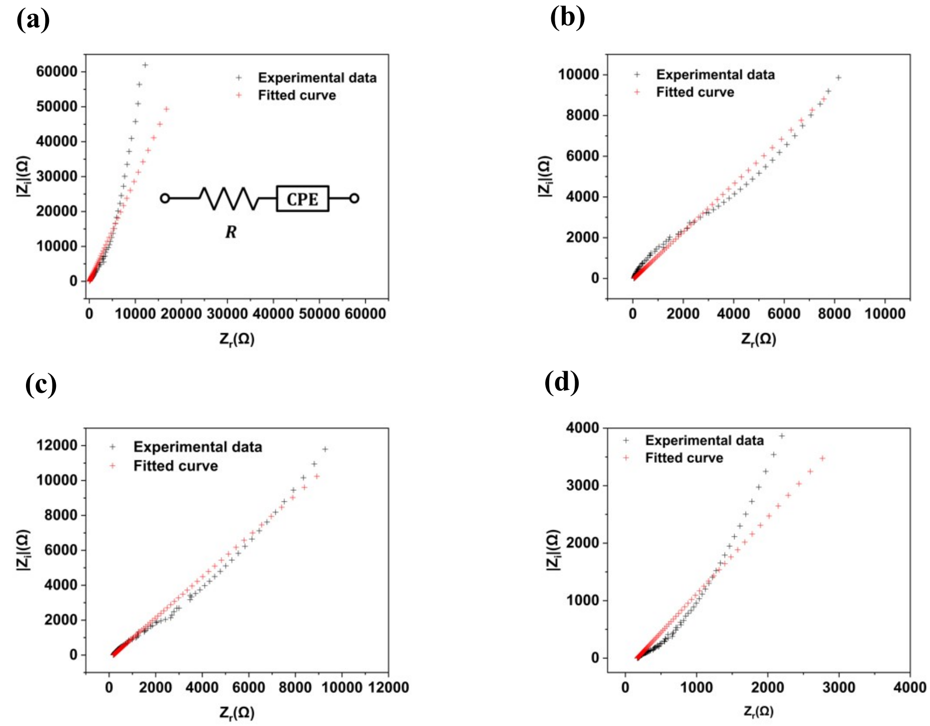

Figure S2. Fitted Nyquist curves (a) for ion-gel (a), PVA/W(0.5) (b), PVA/W+Gl (0.5) (c) and PVA/W+Gl (0.7) (d). (Inset of figure (a) represents the equivalent circuit use for fitting.

Table S2. Parameters obtained from fitting of equivalent circuit.

Sample	R (Ω)	CPE (F.s^(α-1))	α
Ion-gel	55	3.139e-6	0.82
PVA/W(0.5)	50	31.41e-6	0.55
PVA/W+Gl (0.5)	180	27.03e-6	0.55
PVA/W+Gl (0.7)	166	77.75e-6	0.59

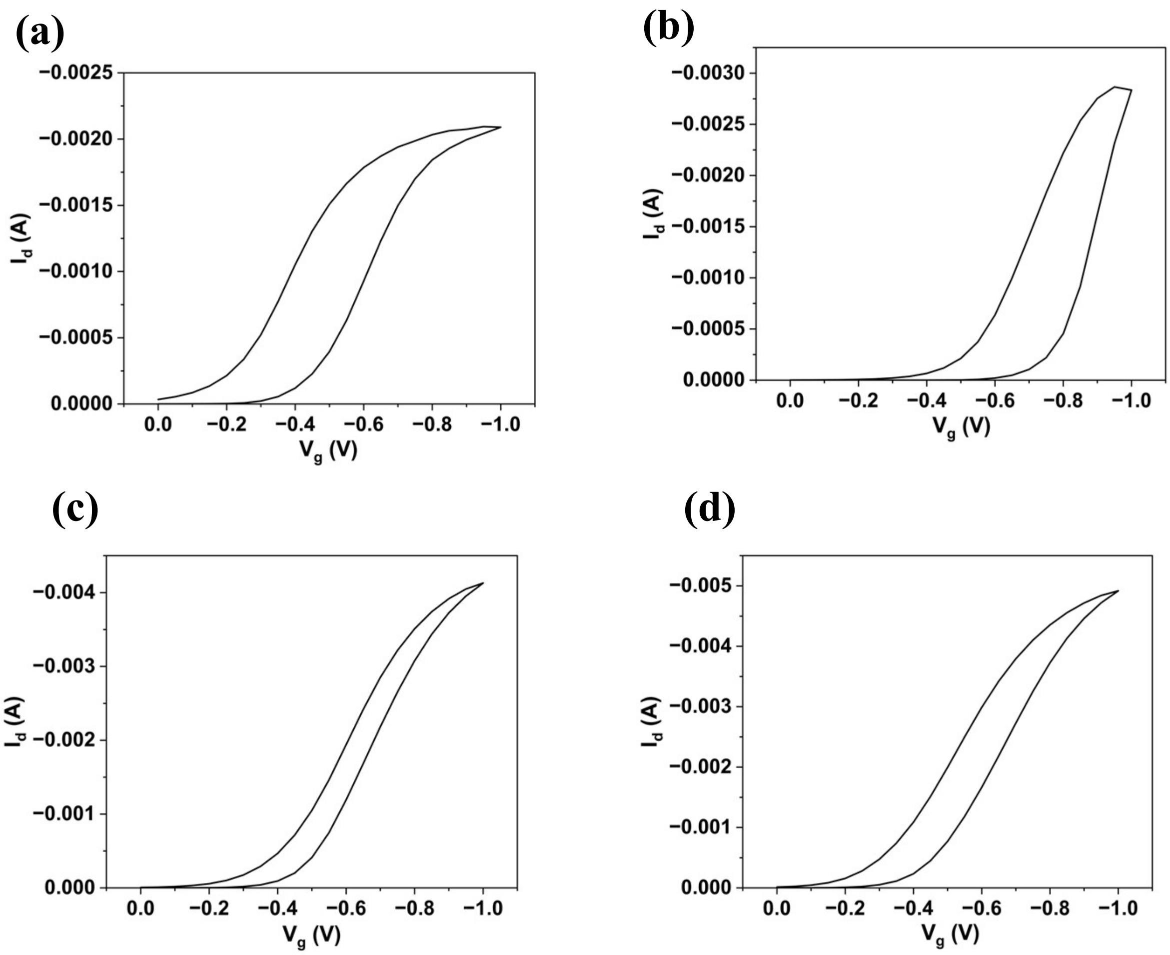

Figure S3. Transfer curves in linear region (V_d= -0.2 V) for PVDF-HFP/IL, PVA/W (0.5), PVA/W+Gl (0.5), and PVA/W+Gl (0.7) gated transistors (a, b, c, d). Scan rate is 50 mV s^{-1}.

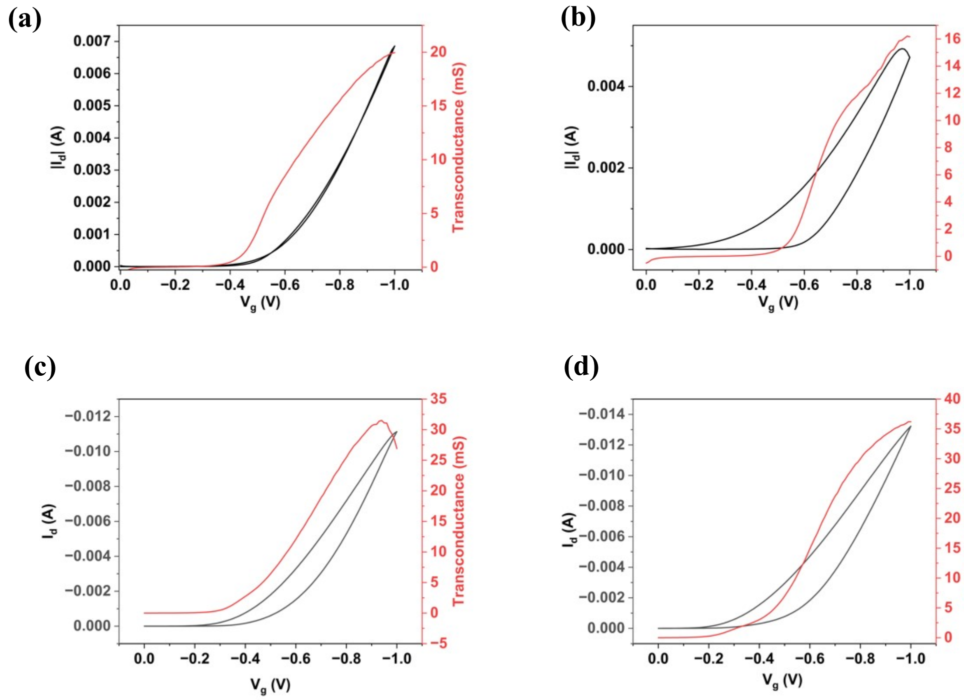

Figure S4. Transfer curves in saturation region (V_d= -0.8 V) for PVDF-HFP/IL, PVA/W (0.5), PVA/W+Gl (0.5), and PVA/W+Gl (0.7) gated transistors (a, b, c, d) (right Y axis represents transconductance. Scan rate is 10 mV s^{-1}

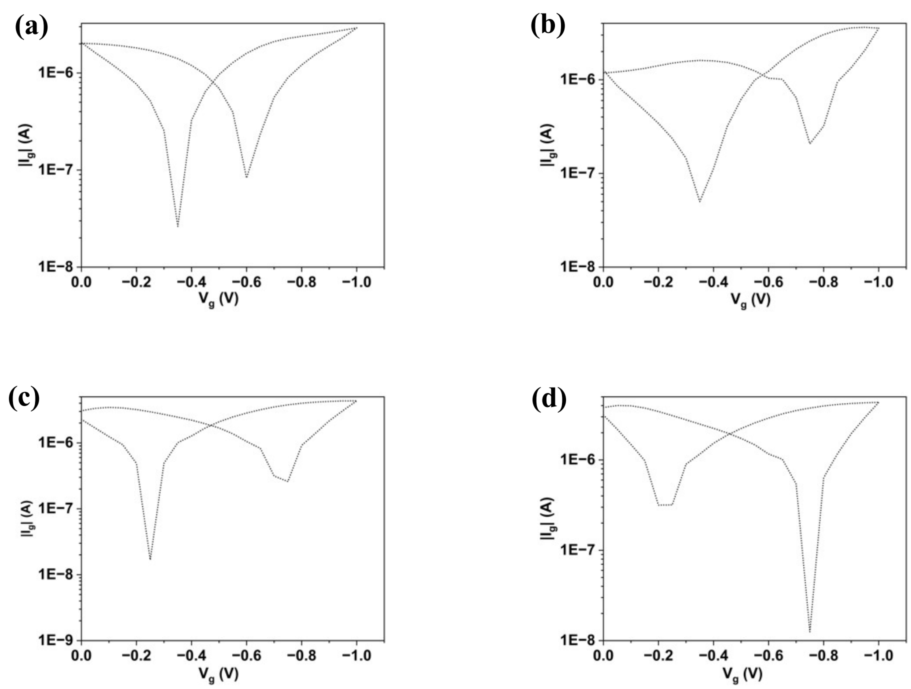

Figure S5.Gate current versus gate voltage for PVDF-HFP/IL, PVA/W (0.5), PVA/W+Gl (0.5), and PVA/W+Gl (0.7) gated transistors (a, b, c, d).

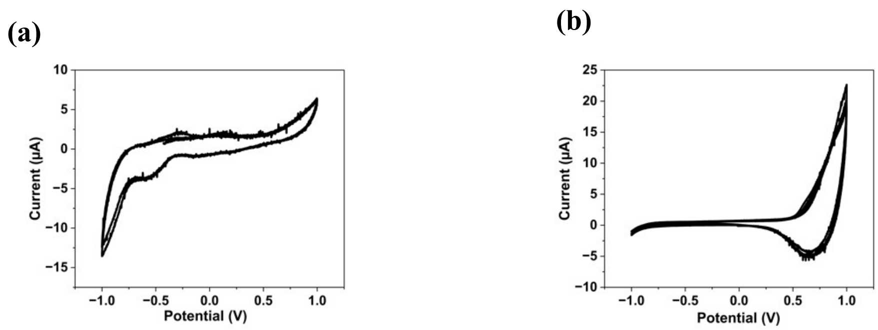

Figure S6. CVs of MIM structure (a), and MIS structure (b).

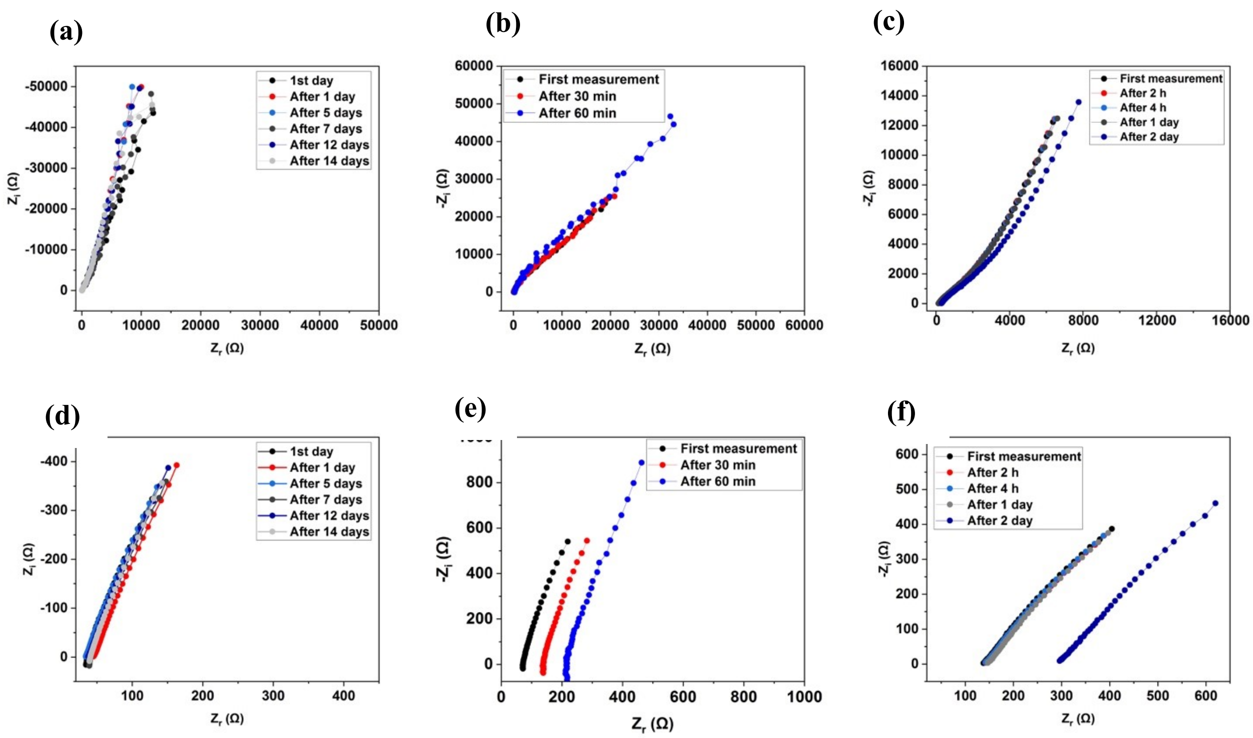

Figure S7. Nyquist curves for MIM structures of PVDF-HFP/IL (a), PVA/W(0.5) (b), , and PVA/W+Gl (0.7) (C). Magnified Nyquist plots at high frequencies related to PVDF-HFP/IL (d), PVA/W(0.5) (e), and PVA/W+Gl (0.7) (f).

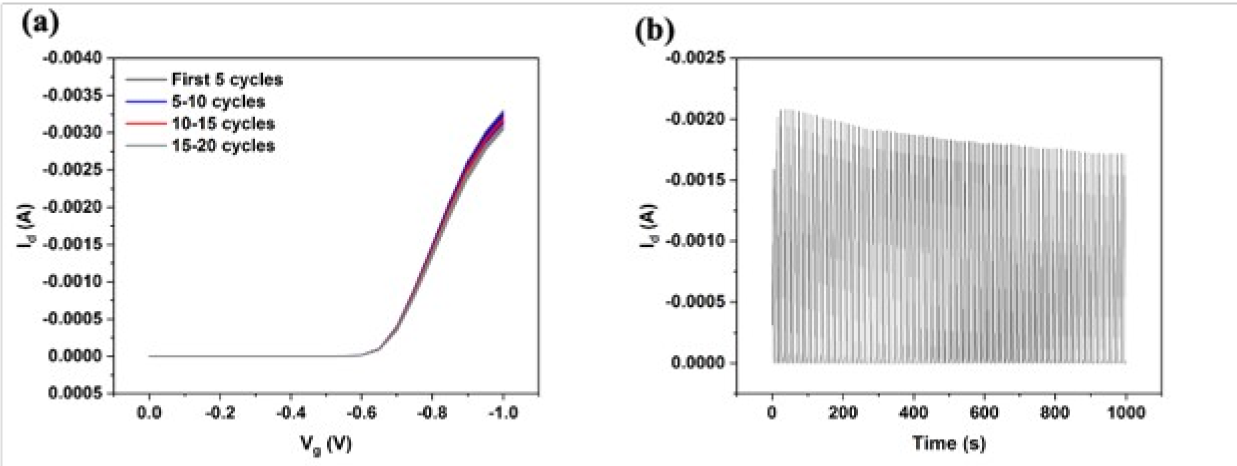

Figure S8. Transfer curves in 20 cycles (V_d= −0.2 V) (a), Pulse measurements with V_d= −0.2 V and square pulse V_g varied from 0 to -0.8 V (pulse width = 5 s) for PVA/W+Gl (0.5) gated transistor (b).

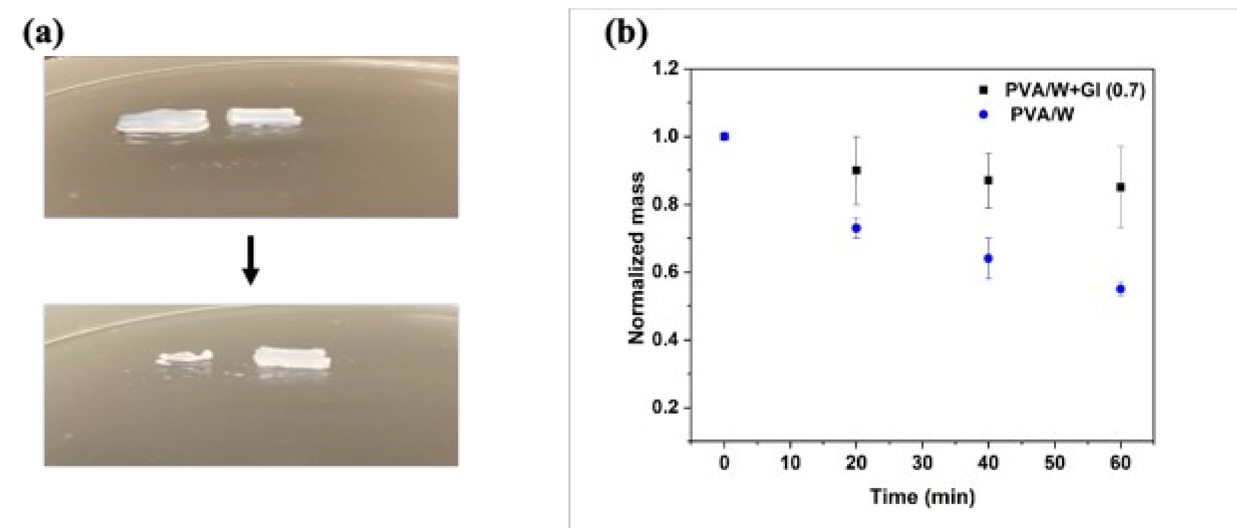

Figure S9. Optical images of PVA/W hydrogel (left) and PVA/W+Gl (0.7) hydrogel (right) directly after taking out from saline solution (top) and after 24 hours in ambient (bottom) (a) and normalized mass of two types of hydrogels after removal from the swelling solution during 60 minutes (values measured every 20 minutes).

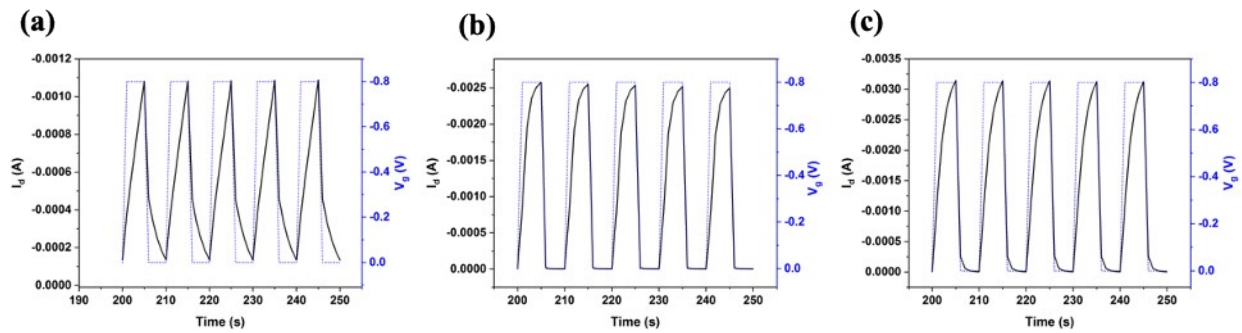

Figure 10. Magnified five cycles of pulse measurements in time scale of 200-250 s for PVDF-HFP/IL (a), PVA/W (0.5) (b) and PVA/W+Gl (0.7) (c) gated transistors.

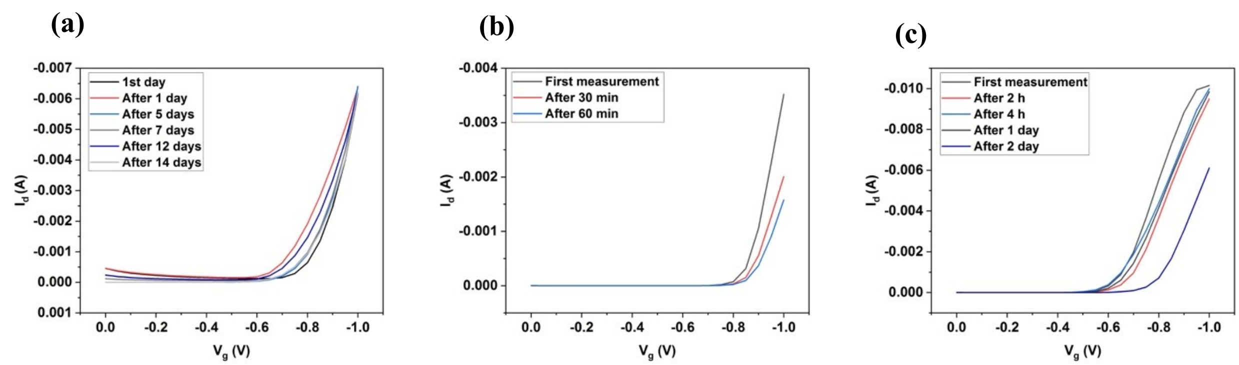

Figure S11: Stability of EGTs for PVDF-HFP/IL (a), PVA/W(0.5) (b), , and PVA/W+Gl (0.7) gated transistors (C).

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