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Supporting Information

Solution-Processed Amorphous Zinc Indium Tin Oxide Thin-Film Transistors with High Stability under AC Stress

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Table S1. Representative electrical performance with deviations of *a*-IGZO TFTs under DC drain stress.

DC stress time (sec)	Mobility ($cm^2 V^{-1} s^{-1}$)	V_{th} (V)	V_{on} (V)	I_{on}/I_{off}
0	1.4 ± 0.2	0.14 ± 0.3	-3.0 ± 1.4	$(1.9 \pm 0.4) \times 10^9$
10	1.4 ± 0.3	0.34 ± 0.2	-3.0 ± 1.4	$(4.5 \pm 0.9) \times 10^9$
60	1.5 ± 0.3	0.010 ± 0.4	-3.0 ± 1.4	$(3.8 \pm 3.7) \times 10^{12}$
100	1.4 ± 0.2	0.32 ± 0.2	-3.0 ± 1.5	$(1.3 \pm 1.2) \times 10^{11}$
1000	1.5 ± 0.2	0.030 ± 0.4	-2.5 ± 1.0	$(1.1 \pm 1.0) \times 10^{10}$
3600	1.6 ± 0.3	0.17 ± 0.3	-2.0 ± 1.2	$(5.9 \pm 2.7) \times 10^9$
Δ	0.2	0.03	1.0	4.0×10^9

Δ: Difference in electrical performance between stress time of 0 and 3600 s.

Table S2. Representative electrical performance with deviations of *a*-IGZO TFTs under AC drain stress.

AC stress time (sec)	Mobility ($cm^2 V^{-1} s^{-1}$)	V_{th} (V)	V_{on} (V)	I_{on}/I_{off}
0	1.6 ± 0.2	1.1 ± 0.3	-3.5 ± 0.8	(3.5 ± 0.5)× 10^6
10	1.6 ± 0.3	1.3 ± 0.2	-2.0 ± 0.5	(3.4 ± 0.3) × 10^6
60	1.7 ± 0.2	1.5 ± 0.3	-2.5 ± 0.2	(3.3 ± 1.2) × 10^6
100	1.7 ± 0.2	1.5 ± 0.2	-2.0 ± 0.4	(3.8 ± 0.3) × 10^6
1000	1.5 ± 0.4	2.6 ± 0.4	-2.0 ± 0.5	(2.5 ± 0.3) × 10^6
3600	1.4 ± 0.3	2.7 ± 0.4	-2.5 ± 0.1	(1.2 ± 0.6) × 10^6
Δ	-0.2	1.6	1.0	-2.3 × 10^6

Δ: Difference in electrical performance between stress time of 0 and 3600 s.

Table S3. Representative electrical performance with deviations of *a*-ZITO (2:1:1) TFTs under AC drain stress.

AC stress time (sec)	Mobility ($cm^2 V^{-1} s^{-1}$)	V_{th} (V)	V_{on} (V)	I_{on}/I_{off}
0	6.8 ± 0.2	0.93 ± 0.2	-2.0 ± 0.5	$(1.1 \pm 1.0) \times 10^{10}$
10	7.0 ± 0.3	1.4 ± 0.1	-1.5 ± 0.2	$(3.5 \pm 2.4) \times 10^{10}$
60	7.1 ± 0.2	1.5 ± 0.2	-1.5 ± 0.2	$(5.6 \pm 5.3) \times 10^{10}$
100	7.1 ± 0.3	1.6 ± 0.2	-1.5 ± 0.5	$(1.1 \pm 1.0) \times 10^{11}$
1000	7.0 ± 0.7	1.5 ± 0.3	-1.0 ± 0.3	$(2.8 \pm 1.7) \times 10^{10}$
3600	7.2 ± 0.6	1.6 ± 0.2	-1.0 ± 0.2	$(3.0 \pm 2.5) \times 10^{10}$
Δ	0.4	0.67	1.0	1.9×10^{10}

Δ: Difference in electrical performance between stress time of 0 and 3600 s.

Table S4. Representative electrical performance with deviations of *a*-ZITO (4:1:1) TFTs under AC drain stress.

AC stress time (sec)	Mobility ($cm^2 V^{-1} s^{-1}$)	V_{th} (V)	V_{on} (V)	I_{on}/I_{off}
0	7.4 ± 0.2	1.3 ± 0.2	-1.0 ± 0.2	$(4.2 \pm 2.2) \times 10^{10}$
10	7.6 ± 0.2	1.5 ± 0.3	-0.5 ± 0.2	$(2.5 \pm 2.4) \times 10^{12}$
60	7.6 ± 0.2	1.5 ± 0.4	-1.0 ± 0.5	$(4.1 \pm 4.0) \times 10^{11}$
100	7.6 ± 0.2	1.6 ± 0.3	-2.0 ± 1.5	$(4.9 \pm 3.5) \times 10^{10}$
1000	7.6 ± 0.2	1.6 ± 0.2	-0.5 ± 0.5	$(2.5 \pm 1.0) \times 10^{11}$
3600	7.7 ± 0.4	1.7 ± 0.2	-0.5 ± 0.5	$(1.5 \pm 1.1) \times 10^{11}$
Δ	0.3	0.4	0.5	1.1×10^{11}

Δ: Difference in electrical performance between stress time of 0 and 3600 s.

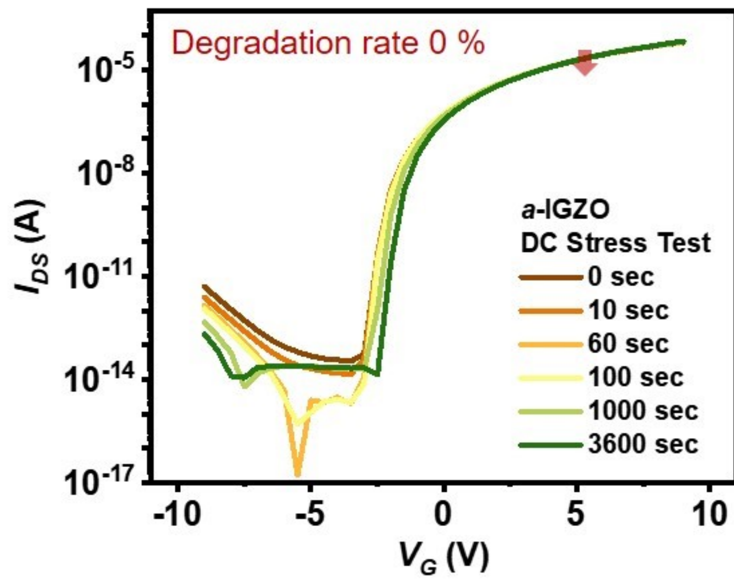

Figure S1. DC stress test results of *a*-IGZO TFTs

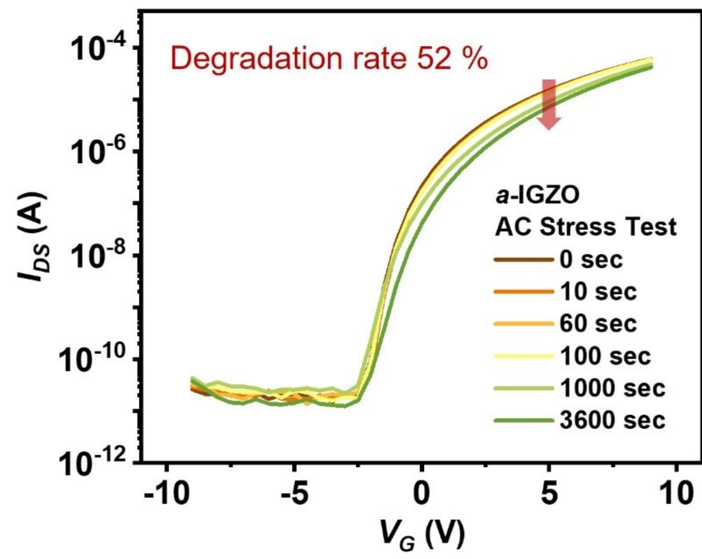

Figure S2. AC stress test result of *a*-IGZO TFT by sweeping the I_{DS}-V_G graph with a reversed direction of drain-source voltage bias.

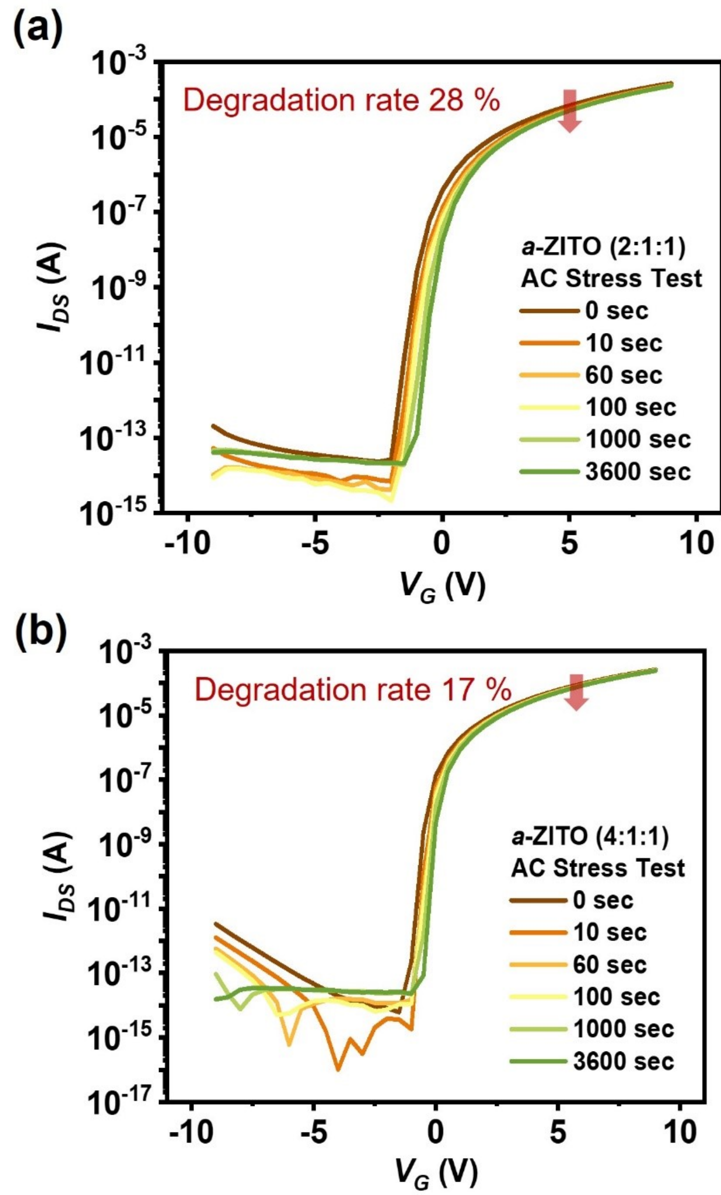

Figure S3. AC stress test results of *a*-ZITO TFTs with various Zn:In:Sn blending ratios of (a) 2:1:1, and (b) 4:1:1.

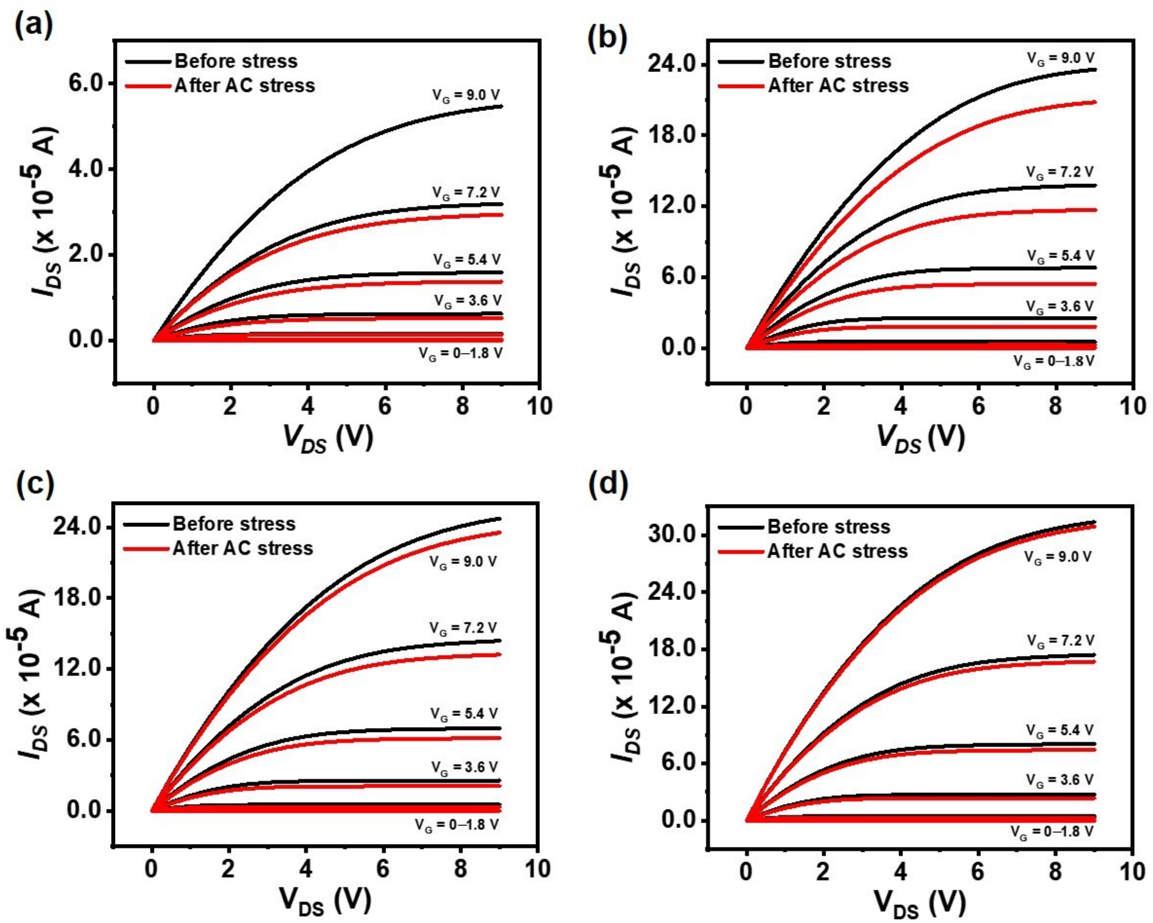

Figure S4. Output curves of (a) *a*-IGZO, (b) *a*-ZITO (2:1:1), (c) *a*-ZITO (4:1:1), and (d) *a*-ZITO (6:1:1) TFTs before and after AC stress of 3600 sec.

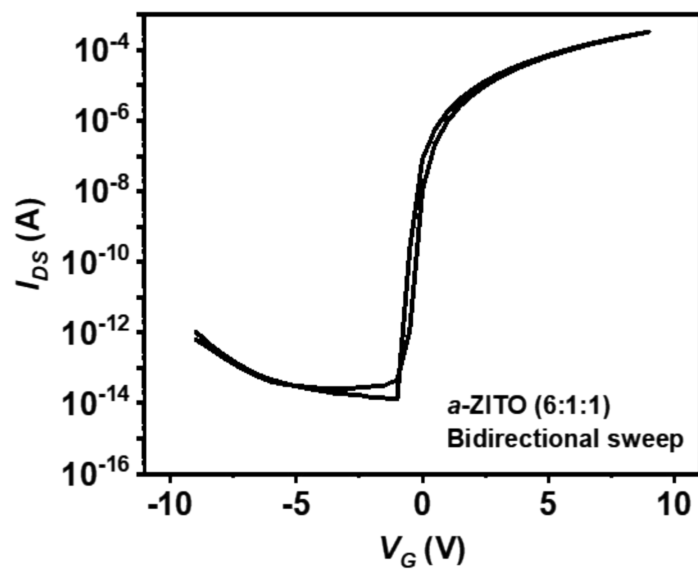

Figure S5. Bidirectional sweep of *a*-ZITO (6:1:1) TFT in dark measurement conditions.

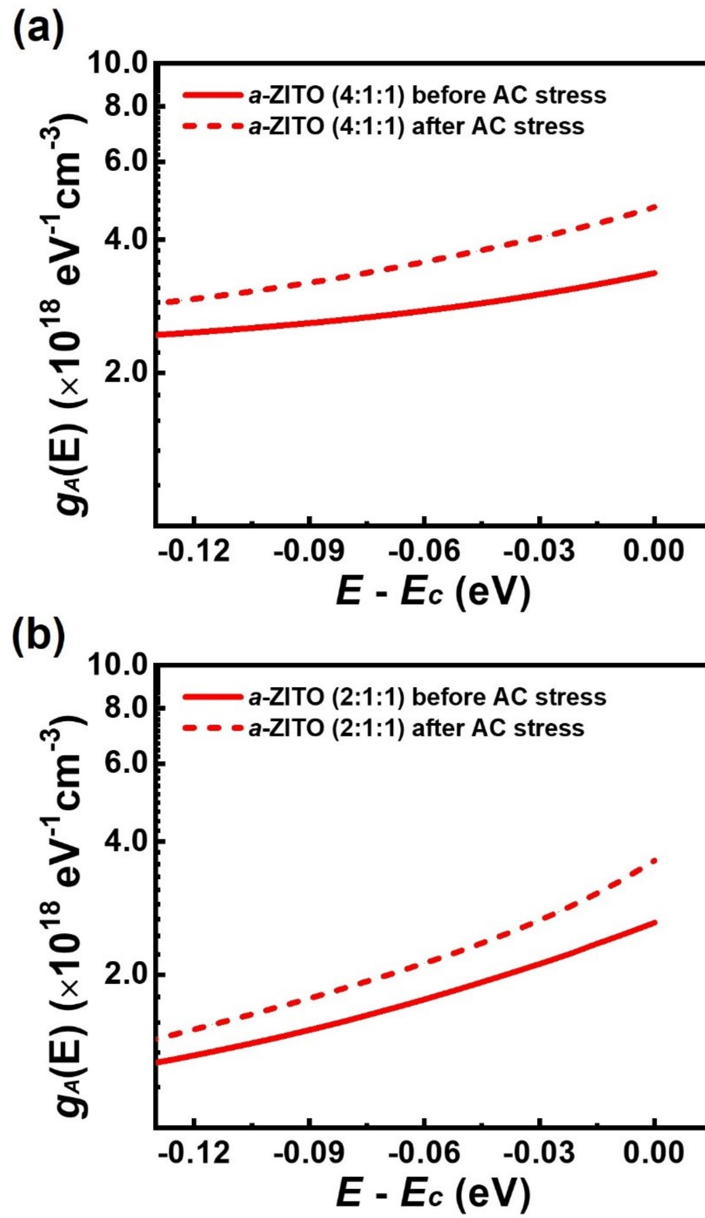

Figure S6. Subgap Density-of-states (g_A(E)) extraction results below the conduction-band-minimum (E_C) of the investigated (a) *a*-ZITO (4:1:1), and (b) *a*-ZITO (2:1:1) TFTs.

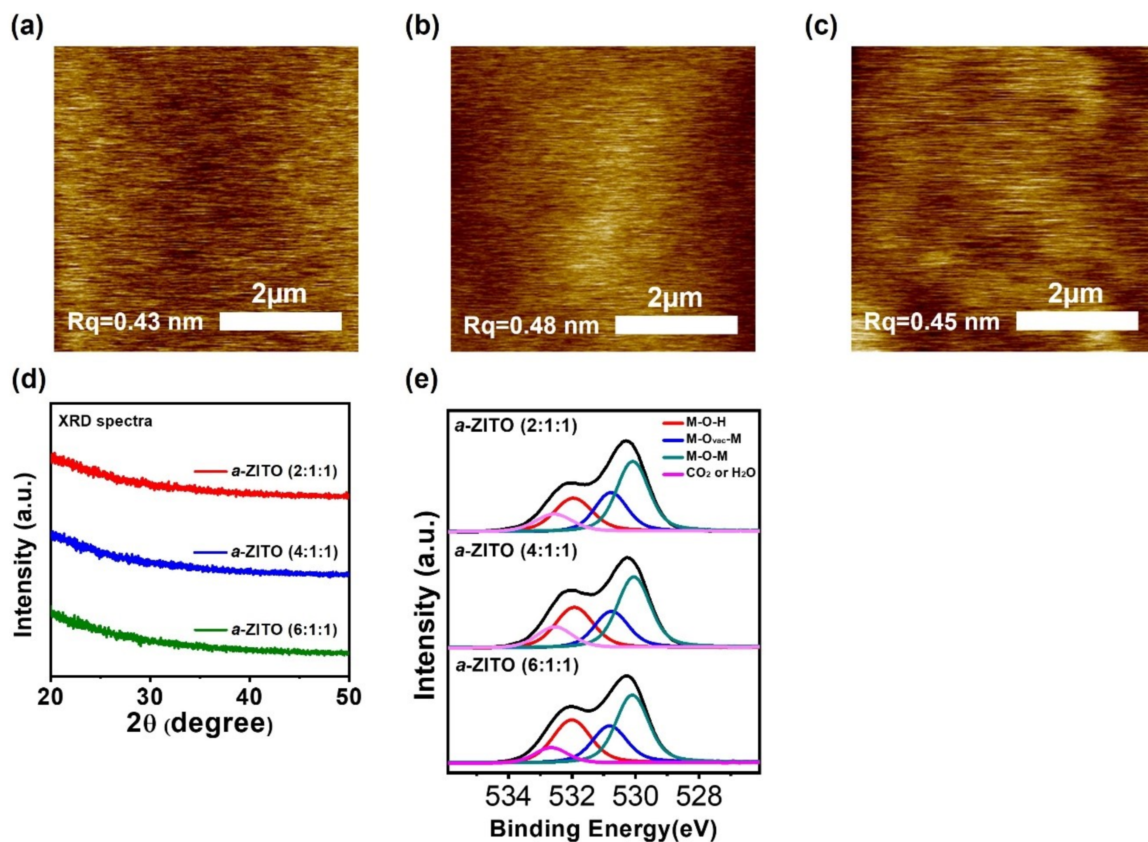

Figure S7. (a-c) Atomic force microscope (AFM) images of (a) *a*-ZITO (2:1:1), (b) *a*-ZITO (4:1:1), and (c) *a*-ZITO (6:1:1) films, (d) X-ray diffraction (XRD) spectra of *a*-ZITO films, and (e) X-ray photoelectron spectroscopy (XPS) analysis of *a*-ZITO films.

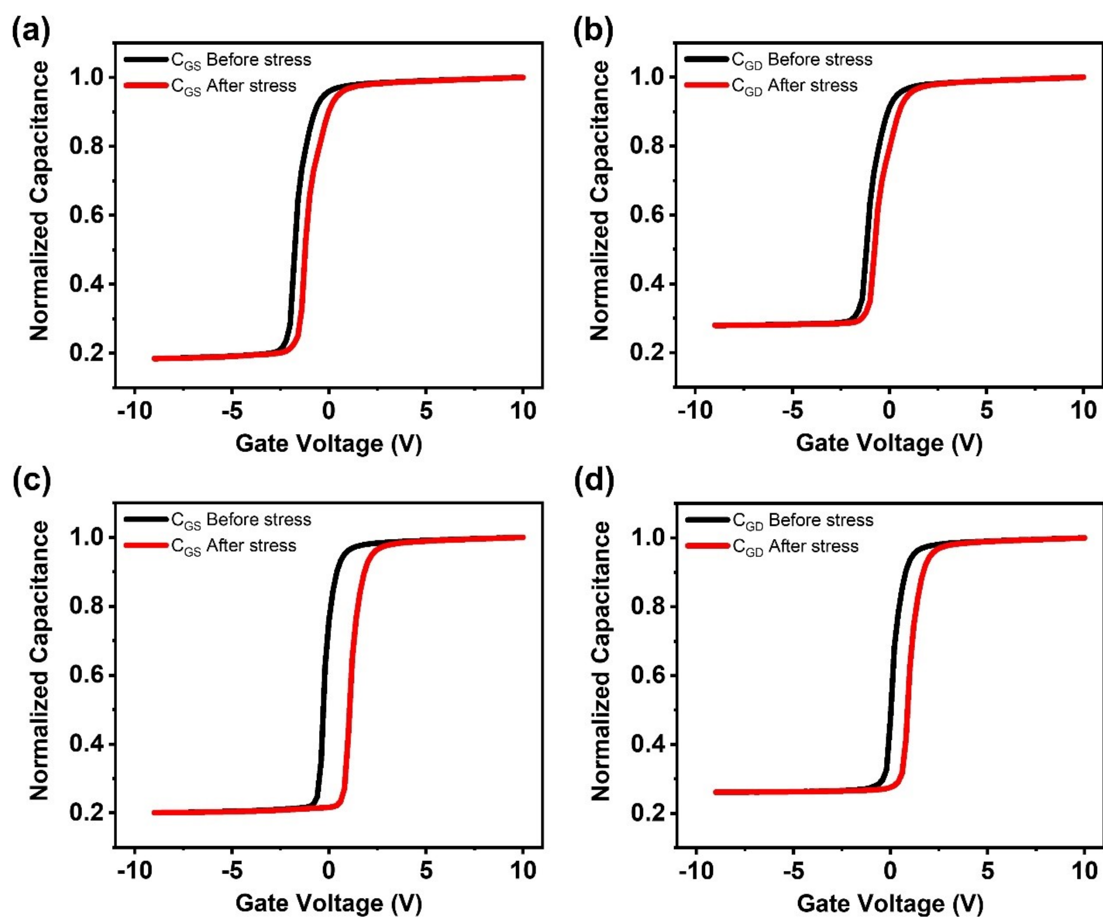

Figure S8. Capacitance-Voltage (C-V) measurement results of (a-b) *a*-ZITO (2:1:1), and (c-d) *a*-ZITO (4:1:1) TFTs: (a, c) gate-to- source (C_{GS}), and (b, d) gate-to-drain (C_{GD}) characteristics before and after AC drain stress of 3600 s.

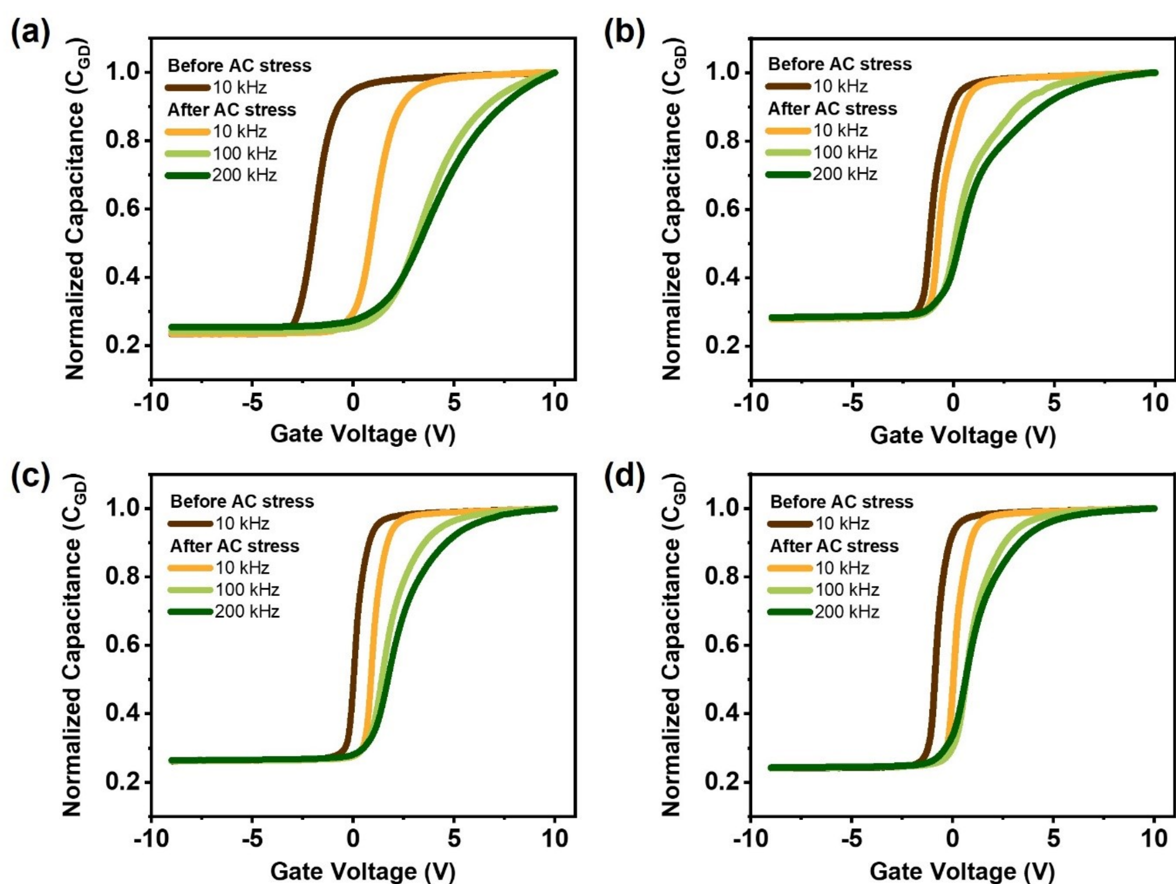

Figure S9. Gate-to-drain (C_{GD}) capacitance-voltage (C-V) characteristics under various gate voltage frequencies for (a) *a*-IGZO, (b) *a*-ZITO (2:1:1), (c) *a*-ZITO (4:1:1), and (d) *a*-ZITO (6:1:1), TFTs before and after AC drain stress of 3600 s.

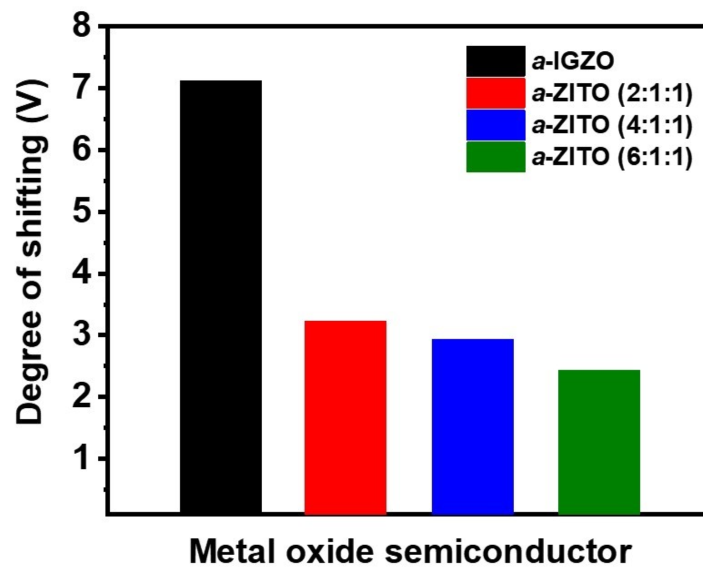

Figure S10. Comparison of the degree of shifting for C_{GD} of *a*-IGZO and *a*-ZITO TFTs.