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Ultraviolet photoconductivity of amorphous ZnAlSnO thin-film transistors

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Table S1 Mobility (μ_{FE}) changes of *a*-ZATO (0, 0.5, 1.0 and 2.0) TFTs under dark, UV illumination for 2 min, and various recovering periods (10, 100, 500, 1000, 5000, and 10000 s) after UV illumination.

Samples	dark	UV 2 min	10 s	100 s	500 s	1000 s	5000 s	10000 s
ZATO (0)	8.00	11.34	11.09	9.74	8.39	8.07	7.68	7.60
ZATO (0.5)	1.10	1.87	1.19	1.08	1.01	1.16	1.13	1.08
ZATO (1.0)	0.36	0.89	0.61	0.54	0.47	0.45	0.42	0.37
ZATO (2.0)	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.02

The μ_{FE} can be determined using Eq. 1 in the text. It can be seen from this Table that μ_{FE} increases much after UV illumination. This increment indicates the improved conductivity of ZATO films, which is resulted from the UV exposure.

Table S2 Device response τ (ps μm^{-2}) changes of *a*-ZATO (0, 0.5, 1.0 and 2.0) TFTs under dark, UV illumination for 2 min, and various recovering periods (10, 100, 500, 1000, 5000, and 10000 s) after UV illumination.

Samples	dark	UV 2 min	10 s	100 s	500 s	1000 s	5000 s	10000 s
ZATO (0)	8.29	2.89	3.53	4.85	7.05	7.73	8.52	8.61
ZATO (0.5)	73.93	19.20	46.91	58.31	66.95	59.95	66.47	71.80
ZATO (1.0)	316.17	55.26	114.77	168.78	220.09	228.77	259.88	299.68
ZATO (2.0)	3204.76	1165.54	1517.65	1946.22	2309.88	2507.36	3126.51	3632.23

The on-resistance (R_{ON}) can be determined using thefollowing equations,

$$R_{ON}=g_d^{-1}=\frac{L}{\mu_{FE} C_i W(V_{GS}-V_{th})}$$

Here, g_d is the transconductance. The device response time is calculated by $\tau=R_{ON}\times C_i$. As can be seen in this Table, for all the samples, after UV illumination, the τ values decrease markedly. While removing the UV sources, the τ values recover slowly back with aging time increasing. This may be the conductivity changes of *a*-ZATO channel films during UV exposure.

Figure S1. Output characteristics of *a*-ZATO (1.0) TFT under UV illumination (for (a) 30 s, (b) 5 min, (c) 10 min, and (d) 20 min) and recovering periods (of (e) 100 s, (f) 500 s, (g) 5000 s, and (h) 10000 s) after UV illumination.

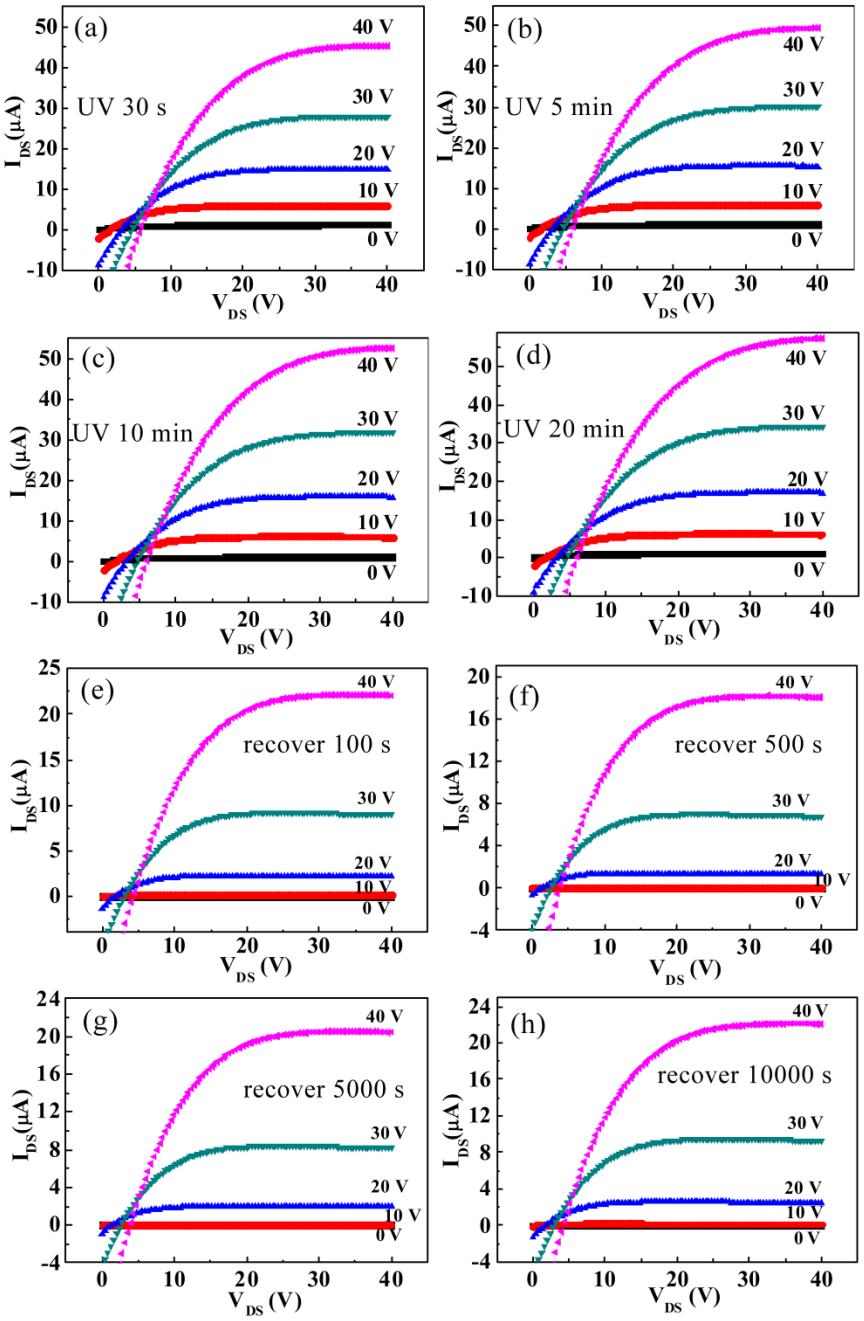

Figure S2. Optical transmittance spectra of *a*-ZATO films with various Al contents (0, 0.5, 1.0 and 2.0). The inset shows the optical band gap energies of *a*-ZATO films.