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Supporting Information

Solution-processed metal oxide arrays with femtosecond laser ablation and annealing for thin-film transistors

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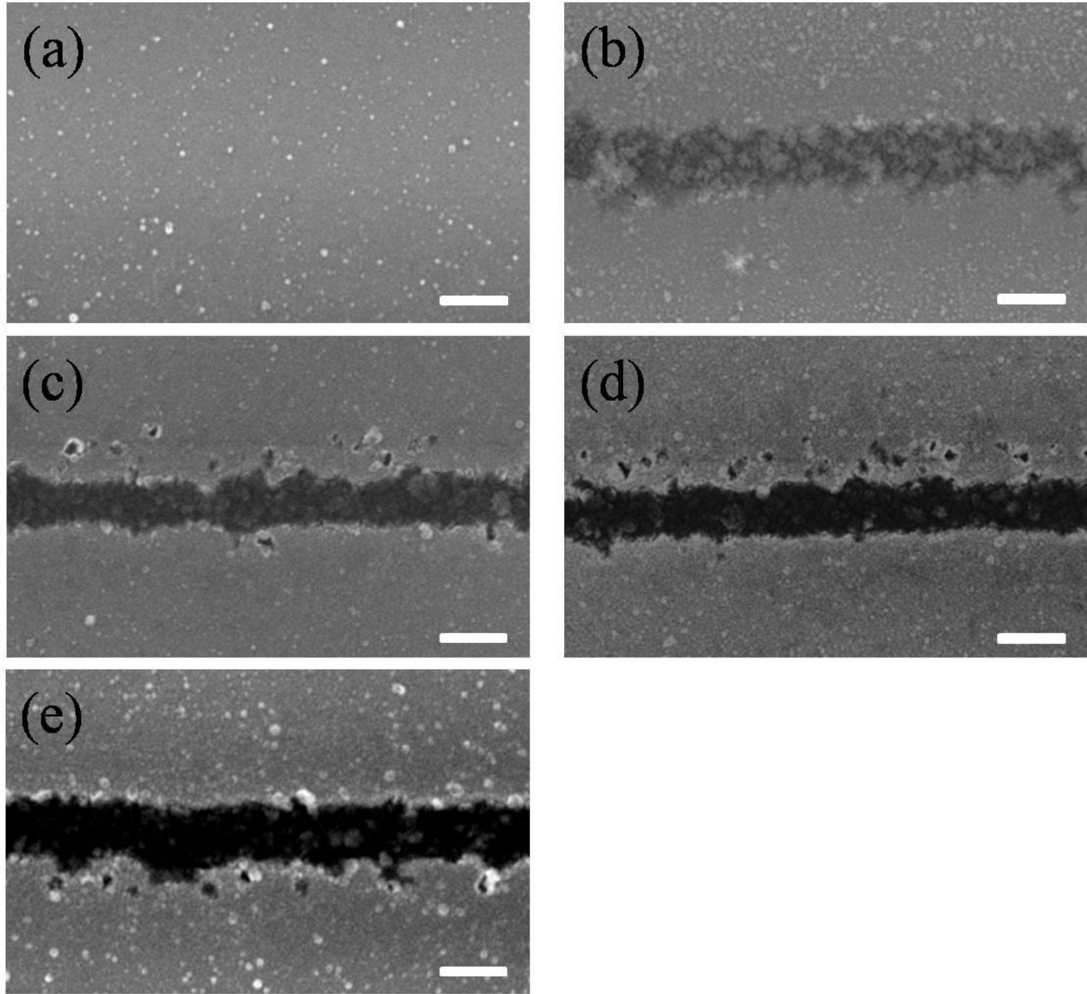

Figure S1. The SEM images about ablation results with different laser intensities with one passes (a) 100 mJ/cm^2, (b) 250 mJ/cm^2, (c) 330 mJ/cm^2, (d) 350 mJ/cm^2 and (e) 370 mJ/cm^2. The scale bar represents 20μm.

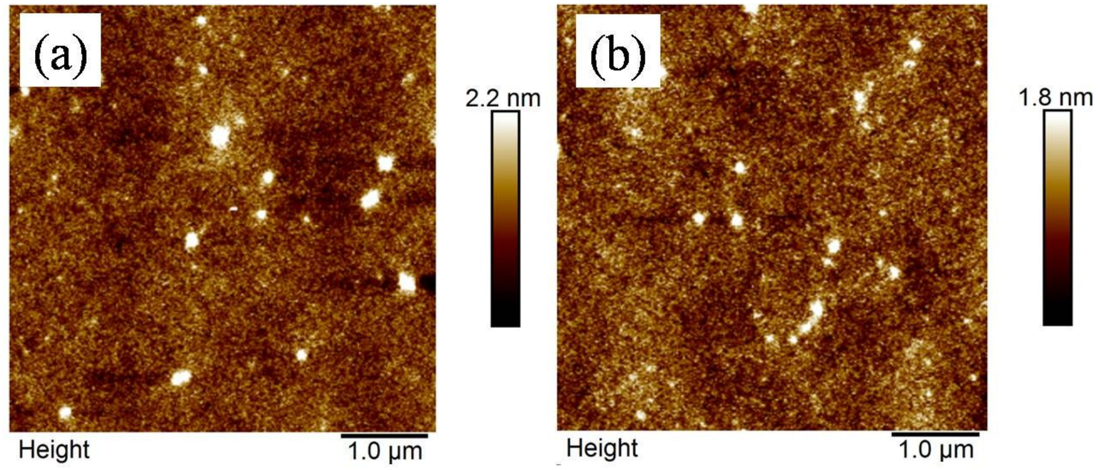

Figure S2. AFM images for IZO film with laser annealing (99 mJ/cm^2) (a) and without laser annealing (b). The surface RMS roughness values are 0.302 nm and 0.255 nm for (a) and (b), respectively.

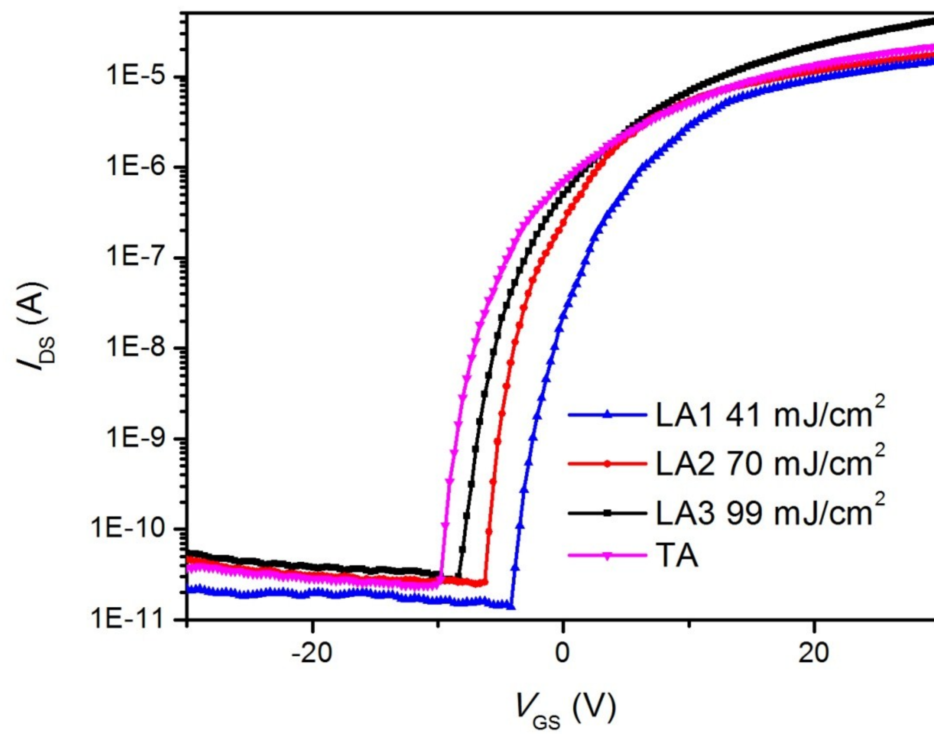

Figure S3. Transfer characteristics of TFT treated with LA (various laser intensities) and TA (V_{DS}=1V)

Table S1. Device characteristics of laser annealed and thermally annealed TFTs. (V_{DS}=1V)

sample	μ_{lin} (cm^2/Vs)	SS (V/dec)	D_{it} (cm^{-2}/eV)
LA 41 mJ/cm^2	2.4±0.2	0.78	2.27×10^{12}
LA 70 mJ/cm^2	4.3±0.2	0.63	1.79×10^{12}
LA 99 mJ/cm^2	8.4±0.2	0.91	2.68×10^{12}
TA	5.0±0.1	0.63	1.79×10^{12}

The field effect electron mobility, subthreshold slope (SS) and interface trap density (D_{it}) were extracted from the linear operating region using the gradual channel approximation according to the following equations, respectively.

$$\mu_{lin} = \frac{g_m L}{W C_i V_{DS}}$$

$$g_m = \frac{\partial I_{DS}}{\partial V_{GS}}$$

$$SS = \left(\frac{dlog(I_{DS})}{dV_{GS}}\right)^{-1}$$

$$D_{it} = \frac{C_i}{q}\left(\frac{q \cdot SS}{kT \cdot ln10} - 1\right)$$

where L and W are the channel length and width, respectively; C_i is the capacitance per unit area of the gate insulator; I_{DS} is the drain-source current; V_{GS} is the gate voltage; V_{DS} is the drain-source voltage; q is the elementary electron charge; and kT is the thermal energy.