Supporting Information

Homojunction Structure Amorphous Oxide Thin Film Transistors with Ultra-high Mobility

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Supplementary figures

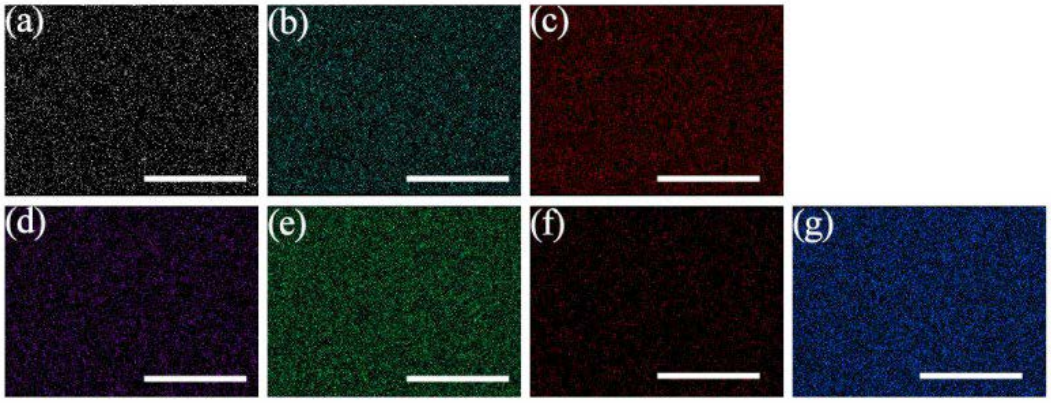

Figure S1 EDS mapping of ZTO thin film annealed at 900 °C, a) Zn, b) Sn, c) O; EDS mapping of ZATO thin film annealed at 500 °C, d) Zn, e) Sn, f) Al, g) O. Scale bar, 4 μm.

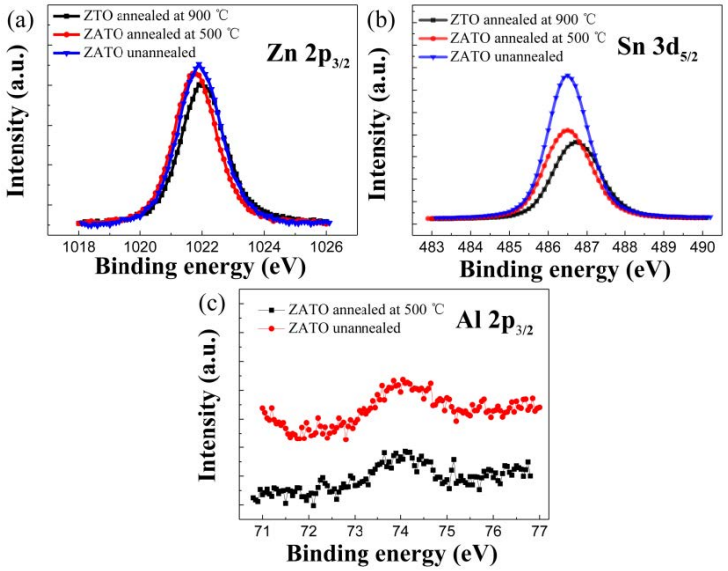

Figure S2 a) Zn $2p_{3/2}$, b) Sn $3d_{5/2}$ and c) Al $2p_{3/2}$ XPS spectra of ZTO film annealed at 900 °C, ZATO film annealed at 500 °C and ZATO film unannealed.

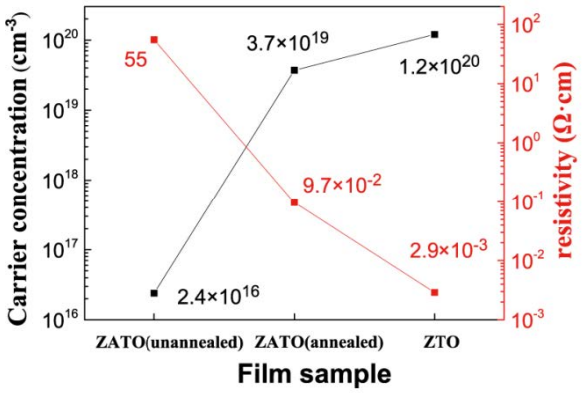

Figure S3 Carrier concentration and resistivity with respect to the ZATO film unannealed, the ZATO film annealed at 500 °C, and the ZTO film annealed at 900 °C.

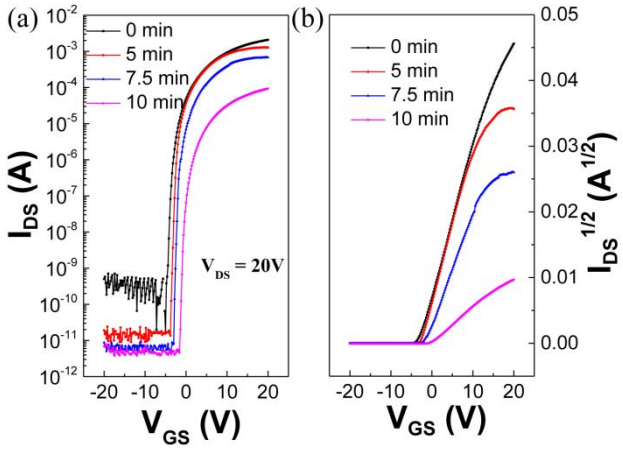

Figure S4 a) Transfer curves at V_{DS}=20 V of TFTs incorporating the homojunction layer with different thicknesses by controlling the sputtering time of the top layer. b) Curves of $I_{DS}^{1/2}$ versus V_{GS} of the corresponding TFTs.

Table S1. Electrical parameters of TFT with homojunction or uniform ZATO layer.

layer structure	I_{off} (A)	I_{on}/I_{off}	V_{th} (V)	μ_{sat} ($cm^2V^{-1}s^{-1}$)	SS ($V \cdot dec^{-1}$)
1-Homojunction	~1.9×10^{-11}	5.62×10^{7}	-1.65	109.5	0.392
2-Homojunction	~1.3×10^{-11}	4.89×10^{7}	-1.83	110.8	0.378
3-Homojunction	~1.7×10^{-11}	9.75×10^{7}	-1.56	108.2	0.352
1-Uniform ZATO	~3.3×10^{-10}	8.98×10^{5}	-3.01	25.2	0.905
2-Uniform ZATO	~5.7×10^{-10}	7.69×10^{5}	-2.76	21.8	0.857
3-Uniform ZATO	~2.4×10^{-10}	5.24×10^{5}	-2.65	22.5	0.883