Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Plasma-Enhanced Atomic Layer Deposition of Nanolaminated $(InO_x)_n(GaZnO_y)_m$ and the Associated Thin-Film Transistor Properties

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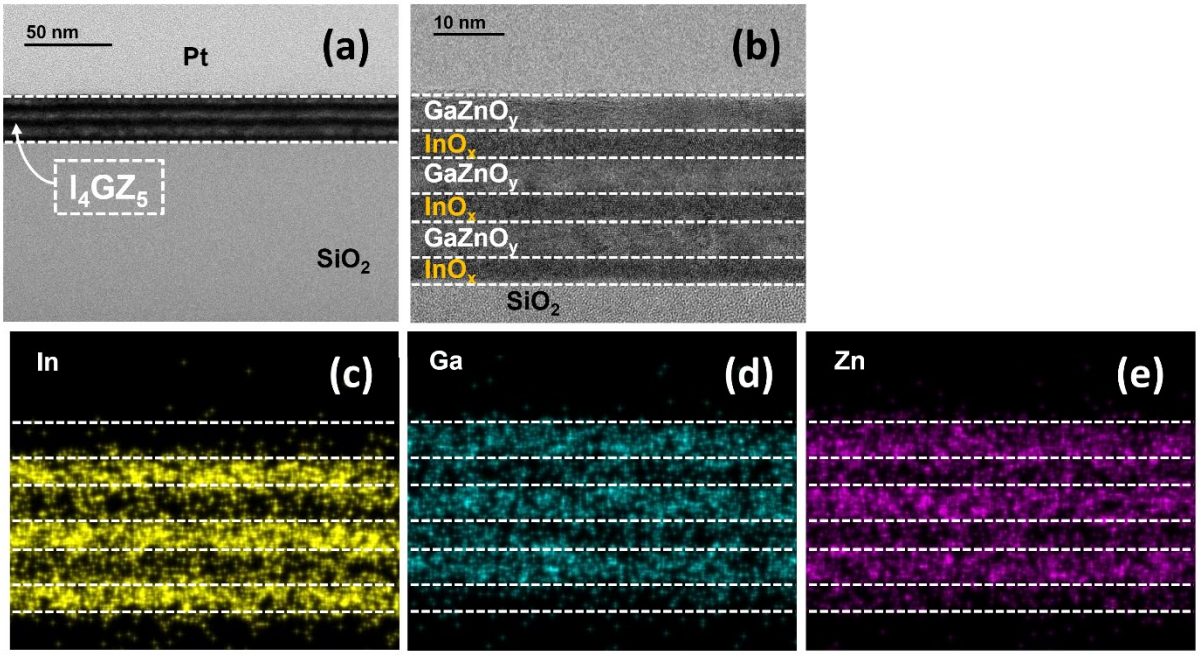

Figure S1. Cross-section of TEM image of I_4GZ_5 film ((a) and (b)), and Indium, Gallium, and Zinc metal mapping of nanolaminate IGZO thin film corresponding to (c), (d), and (e) respectively.

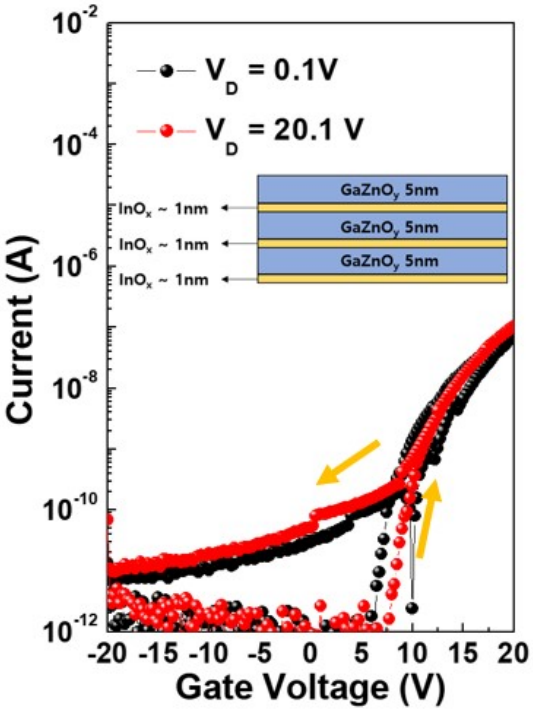

Figure S2. Transfer curves of nanolaminated TFTs with very thin InO_x (1 nm) layer.

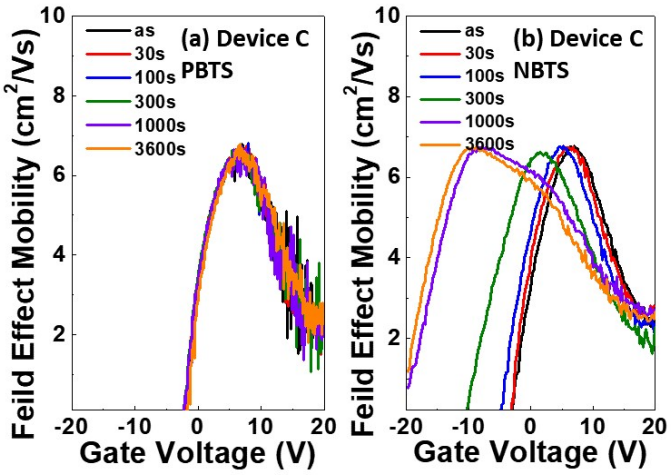

Figure S3. V_{GS}-Field effect mobility curves with increasing stress time.

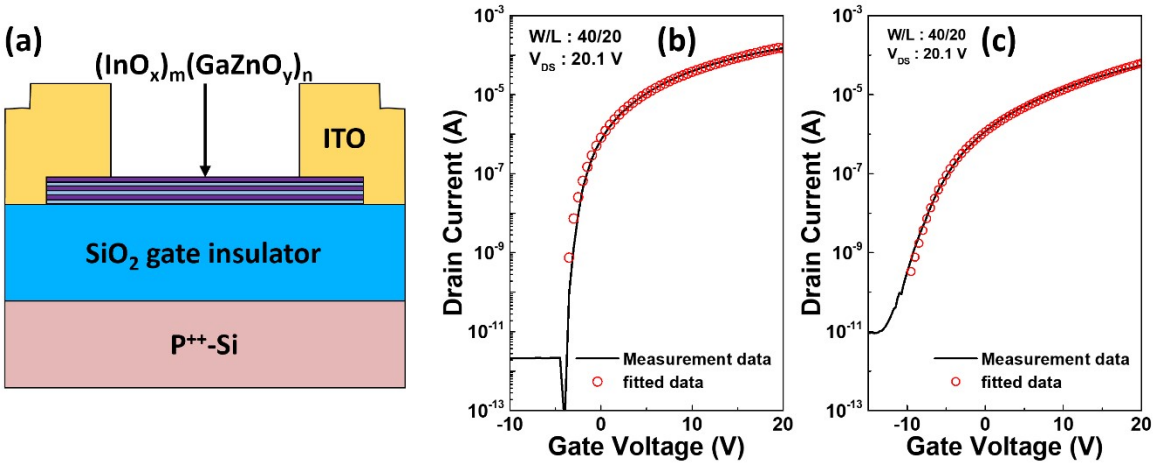

Figure S4. (a) Cross-section of nanolaminate $(InO_x)_n(GaZnO_y)_m$ TFT and simulated fitting results from the measured transfer characteristic of I_4-GZ_5 and I_8-GZ_5 ((b) and (c), respectively)

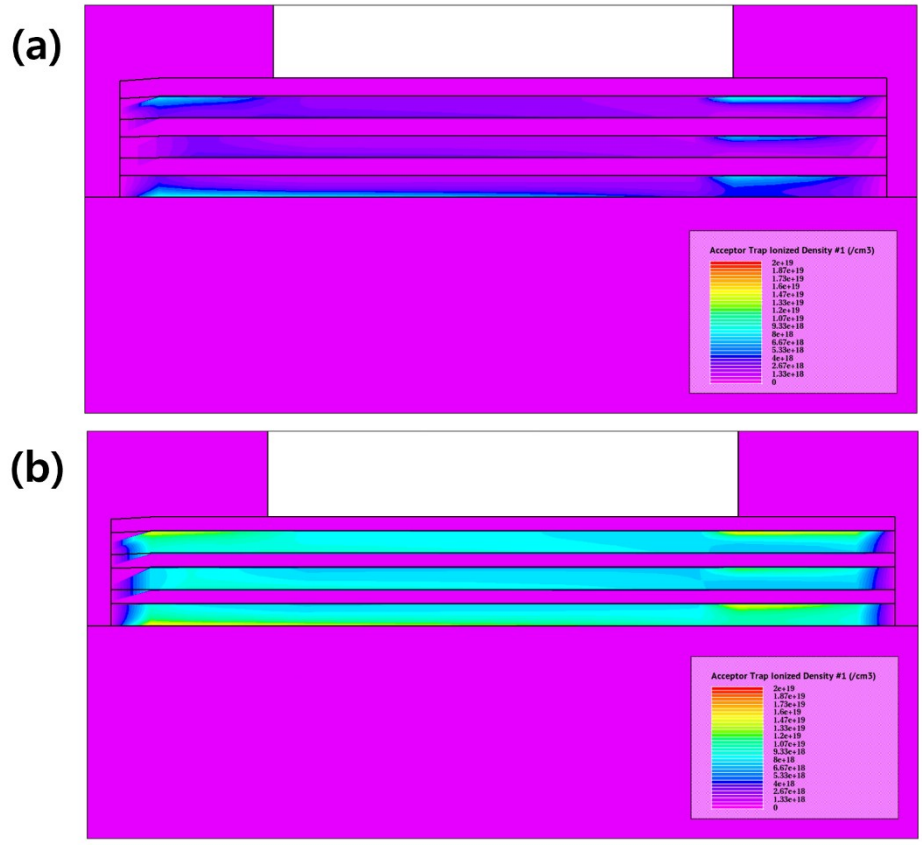

Figure S5. The contour mapping about activated electron acceptor sites under TFT operation state (V_{GS} = 20V, V_{DS} = 20.1 V) of (a) I_4-GZ_5 and (b) I_8-GZ_5 TFT.

Table S1. The simulation parameters of InO_x and $GaZnO_y$ layer in I_4-GZ_5 TFT.

InO_x		**$GaZnO_y$**	
Concentration (#/cm^3)	$9 \cdot 10^{17}$	Concentration (#/cm^3)	$5 \cdot 10^{16}$
N_{TA} (#/cm^3·eV)	$3 \cdot 10^{20}$	N_{TA} (#/cm^3·eV)	$1.95 \cdot 10^{20}$
W_{TA} (eV)	0.0437	W_{TA} (eV)	0.03
N_{TD} (#/cm^3·eV)	$4.5 \cdot 10^{20}$	N_{TD} (#/cm^3·eV)	$1.95 \cdot 10^{20}$
W_{TD} (eV)	0.11	W_{TD} (eV)	0.1
N_{GA} (#/cm^3·eV)	$3 \cdot 10^{18}$	N_{GA} (#/cm^3·eV)	$4 \cdot 10^{17}$
W_{GA} (eV)	0.13	W_{GA} (eV)	0.13
E_{GA} (eV)	1.8	E_{GA} (eV)	2.0
N_{GD} (#/cm^3·eV)	$1 \cdot 10^{17}$	N_{GD} (#/cm^3·eV)	$9 \cdot 10^{17}$
W_{GD} (eV)	0.1	W_{GD} (eV)	0.1
E_{GD} (eV)	2.75	E_{GD} (eV)	2.75

Table S2. The simulation parameters of InO_x and $GaZnO_y$ layer in I_8-GZ_5 TFT.

InO_x		**$GaZnO_y$**	
Concentration (#/cm^3)	$7.2 \cdot 10^{18}$	Concentration (#/cm^3)	$5 \cdot 10^{16}$
N_{TA} (#/cm^3·eV)	$3 \cdot 10^{20}$	N_{TA} (#/cm^3·eV)	$1.95 \cdot 10^{20}$
W_{TA} (eV)	0.055	W_{TA} (eV)	0.03
N_{TD} (#/cm^3·eV)	$4.5 \cdot 10^{20}$	N_{TD} (#/cm^3·eV)	$1.95 \cdot 10^{20}$
W_{TD} (eV)	0.39	W_{TD} (eV)	0.1
N_{GA} (#/cm^3·eV)	$9.2 \cdot 10^{18}$	N_{GA} (#/cm^3·eV)	$4 \cdot 10^{17}$
W_{GA} (eV)	0.42	W_{GA} (eV)	0.13
E_{GA} (eV)	1.8	E_{GA} (eV)	2.0
N_{GD} (#/cm^3·eV)	$1 \cdot 10^{17}$	N_{GD} (#/cm^3·eV)	$9 \cdot 10^{17}$
W_{GD} (eV)	0.1	W_{GD} (eV)	0.1
E_{GD} (eV)	2.75	E_{GD} (eV)	2.75