Electronic Supplementary Information

Besides the first, second ITZO and Zn doped In_2O_3 devices, other ITZO devices are listed in below. These devices were fabricated and electrical measurement were performed in same condition or ambient with previous ones. SEM, EDX and current-voltage characteristics are listed for all these devices.

• Third ITZO Device



Fig. S1. SEM and EDX analysis results of third ITZO device



Fig. S2 I-V characteristics in dark and under UV light of third ITZO device.

5 8 10 0 1 2 3 4 full Scale 5257 cts Cursor: 6.221 (313 cts) Weight% Weight% Element Intensity Atomic% App Conc. Corrn. Sigma 0.19 20.05 OK 5.87 0.4273 11.11 Si K 94.64 1.0369 73.84 0.21 75.94 Zn K 1.32 0.8423 1.27 0.07 0.56 10.69 0.7677 11.27 0.11 2.83 In L in L 2.19 0.7046 2.52 0.11 0.61 100.00 Totals 32 0

• Fourth ITZO Device

Fig. S3 SEM and EDX analysis for the fourth ITZO device.



Fig. S4 Current-voltage characteristic of the fourth ITZO device in dark and under UV light.

• Fifth ITZO Device



Fig. S5 SEM and EDX analysis results of fifth ITZO device.



Fig. S6 Current-voltage characteristic of fifth ITZO device in dark and under UV light.

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Alter Star	0 1 Full Scale 554 c	2 3 ts Cursor: 6.177	4 5 (96 cts)	5 6	7 8	9 10 keV
	Element	App	Intensity	Weight%	Weight%	Atomic%
		Conc.	Corrn.		Sigma	114
	OK	4.55	0.5039	10.96	0.29	18.70
	Si K	69.45	1.0466	80.43	0.33	78.19
	Zn K.	4.07	0.8284	5.96	0.16	2.49
	Zn K In L	4.07 0.86	0.8284 0.7376	5.96 1.42	0.16 0.12	2.49 0.34

• Sixth ITZO Device

Fig. S7 SEM and EDX analysis results of sixth ITZO device.



Fig. S8 Current-voltage characteristics of sixth ITZO device in dark and under UV light.

- 5 6 3.482 (577 cts) App Intensity Weight% Weight% Atomic% Conc Corrn Sigma 2.51 0.4476 8.23 0.33 14.40 83.57 0.39 63.66 1.1126 83.89 0.12 0.28 0.37 0.8306 0.66 2.93 0.7397 5.81 0.18 1.41 0.18 0.65 0.6803 0.33 1.41 100.00 0 10
- Seventh ITZO Device

Fig. S9 SEM and EDX analysis results of seventh ITZO device.



Fig. S10 Current-voltage characteristics of seventh ITZO device in dark and under UV light.



Fig. S11 Current-voltage characteristics of third, fourth, fifth, sixth and seventh ITZO device in dark.



Fig. S12. The I-V measurement result of the ITZO device with nanowire and without nanowire between Si electrodes. The measurement result confirmed that no conductivity after broke the nanowires.