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Supporting information

Solution processed Li_5AlO_4 dielectric for low voltage transistor fabrication and its application for metal oxide/quantum dot heterojunction phototransistor

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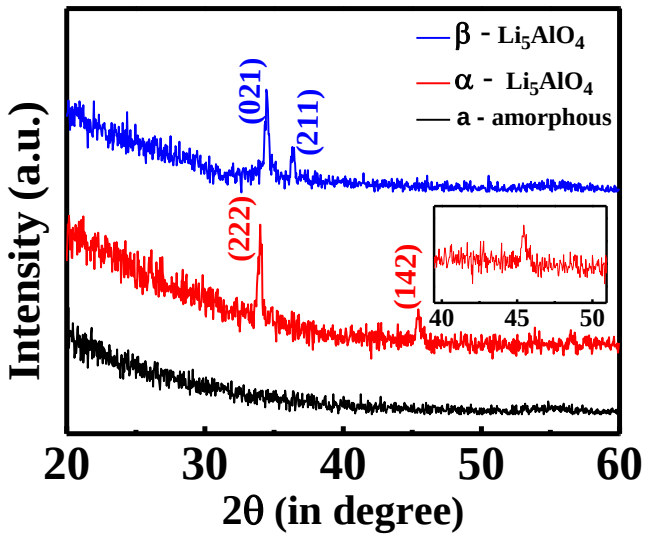

Fig. 1S. Grazing incidence X-ray diffraction (GIXRD) analysis of Li_5AlO_4 dielectric thin film

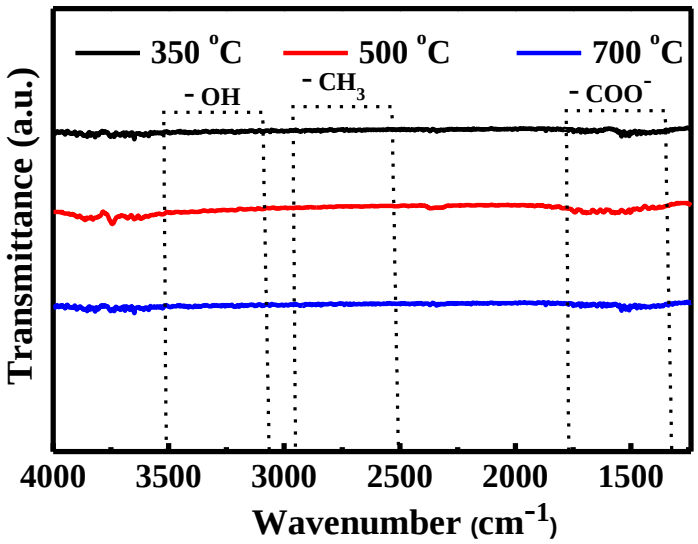

Fig. 2S. FTIR analysis of Li_5AlO_4 dielectric thin film anneal at 350 °C, 500 °C and 700 °C

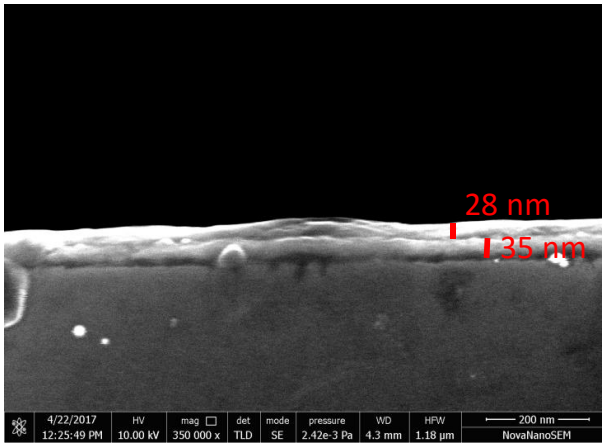

Fig. 3S: Cross-sectional scanning electron micrograph of p++-Si/ α-Li_5AlO_4/ IZO film

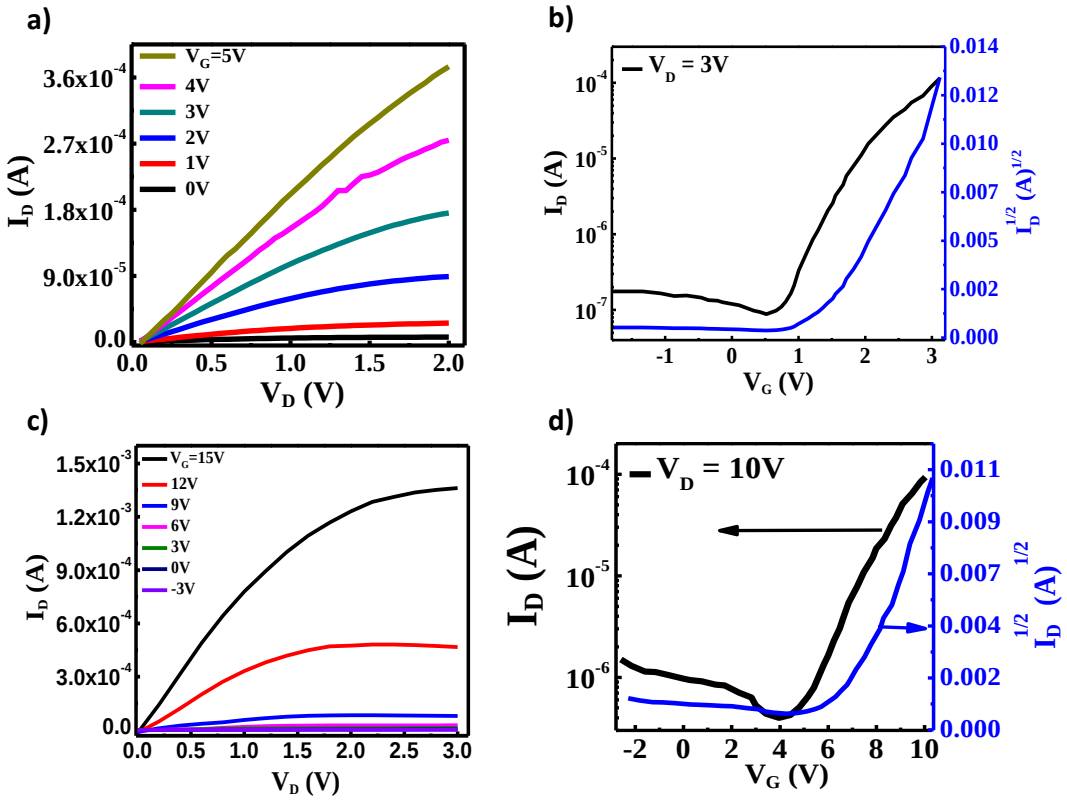

Fig. 4S The output characteristics for TFT fabricated with a) β-Li_5AlO_4 c) a- Li_5AlO_4 dielectric. Transfer characteristics for TFT fabricated with b) β-Li_5AlO_4 d) a- Li_5AlO_4 dielectric.

Table 1S: Comparison with recently published other high – k dielectric TFT

Dielectric Materials	Semico-nductor	Fabrication Route	Capacitance (C) $nFcm^{-2}$	Mobility (μ) cm^2V^{-1} Sec^{-1}	Product of capacitance and mobility (μ.C) nF V^{-1} Sec^{-1}	Novelty	Reference
α-Li_5AlO_4	IZO	Solution - Processed	332	21.4	7304	New TFT gate dielectric. High capacitance and mobility (μ.C) which result high current density TFT	This work
$HfLaO_x$	ZnO	Solution - Processed	190.09	1.6	330.15	Solution processed TFT gate dielectric	1
LiO_x	In_2O_3	Solution - Processed	465	5.7	2650	New sol-gel derived TFT gate dielectric	2
Strontium titanate	Pentace ne, CuPc	RF magnetron sputtering	41	2.0	2.46	Flexible device	3
Strontium oxide (SrO_x)	In_2O_3	Solution - Processed	350	5.6	1963	Solution processed TFT gate dielectric	4
Magnesi-um titaniumoxide ($Mg_{0.6}Ti_{0.4}O$)	IZO	Solution - Processed	50	3.4	170	New sol-gel derived TFT gate dielectric	5

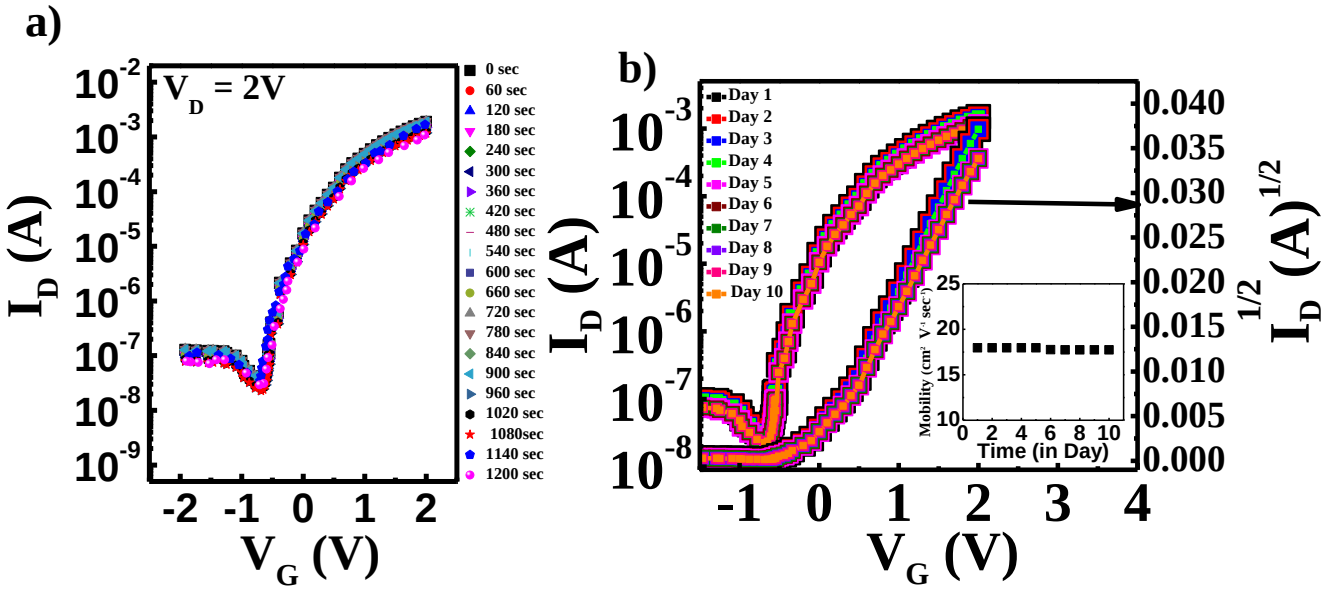

Fig. 5S Stability test of a α-Li_5AlO_4 dielectric TFT a) bias stress stability b) ambient atmosphere storage stability

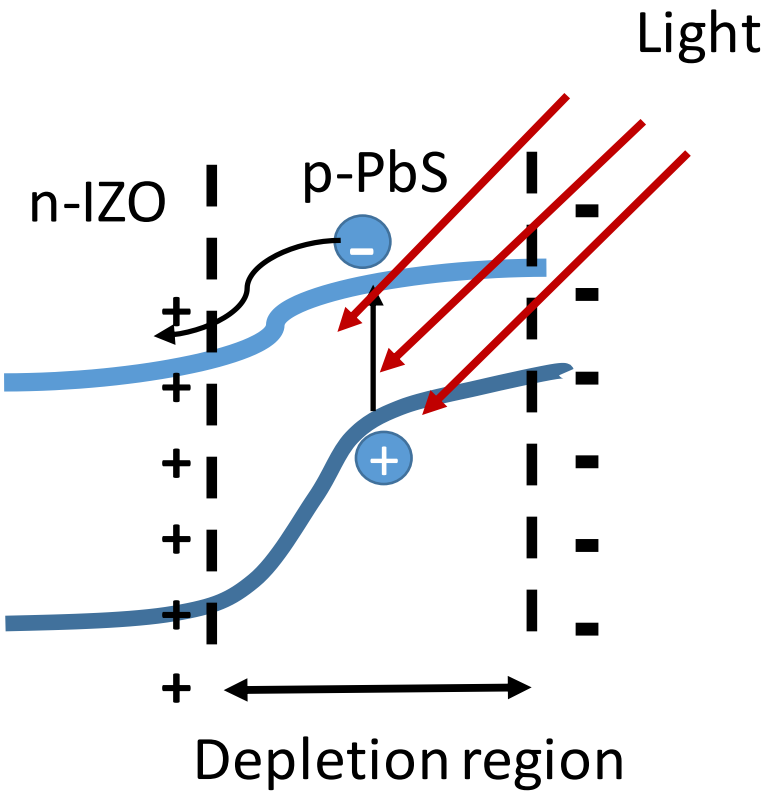

Fig. 6S Depletion layer formation of p-PbS/n-IZO heterojunction and photogenerated e-h separation due to the effect of barrier potential.

References:

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2. A. Liu, G. Liu, C. Zhu, H. Zhu, E. Fortunato, R. Martins and F. Shan, *Adv. Electron. Mater*, 2016, **2**, n/a-n/a.
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