

Supporting information

Article

Remarkable Stability Improvement of ZnO TFT with Al₂O₃ Gate Insulator by Yttrium Passivation with Spray Pyrolysis

Jewel Kumer Saha,^{1,2} Ravindra Naik Bukke,¹ Narendra Naik Mude,¹ and Jin Jang^{1*}

¹ Advanced Display Research Center (ADRC), Department of Information Display, Kyung Hee University, 26, Kyungheedae-ro, Dongdaemun-gu, Seoul 02447, Korea,

² Department of Physics, Jagannath University, Dhaka-1100, Bangladesh

* E-mail: jjang@khu.ac.kr

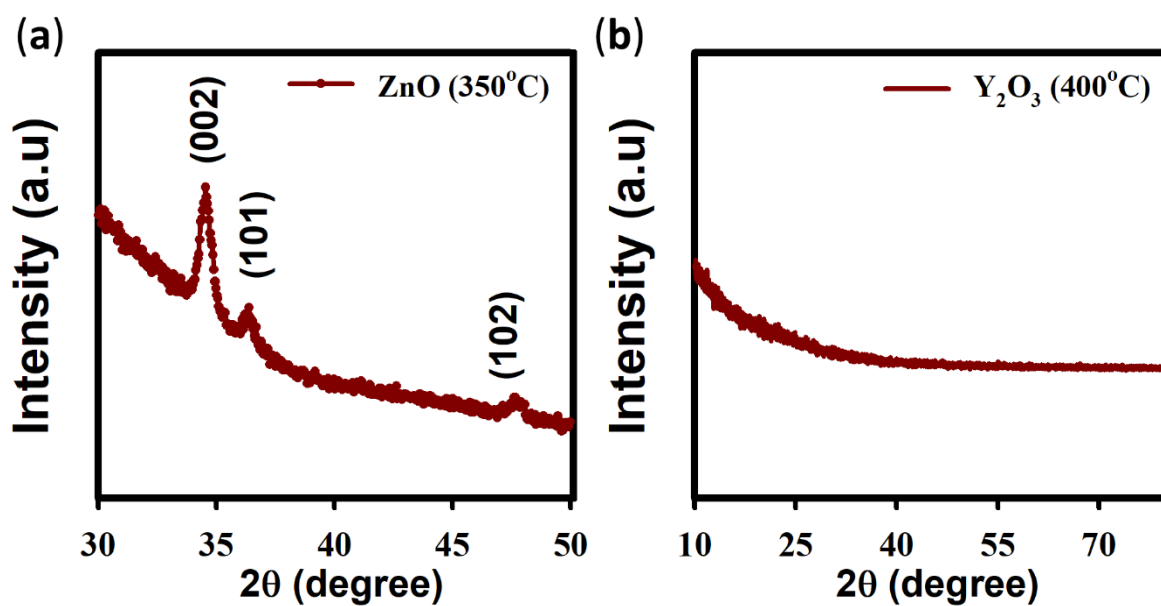


Figure S1. XRD spectra of (a) ZnO film deposited at 350°C (b) Y₂O₃ film deposited at 400°C. The three peaks corresponded to the (002), (101), and (102) planes of hexagonal wurtzite structure where the most preferred orientation is (002) plane. The Y₂O₃ film shows no prominent XRD peak confirms the amorphous nature.

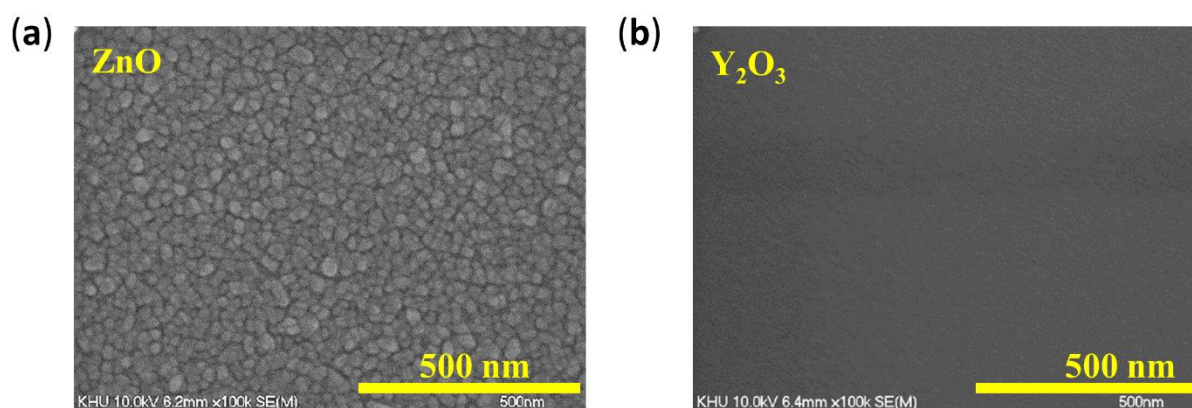


Figure S2. SEM image of (a) nano-crystalline ZnO film (b) amorphous Y₂O₃ film. The ZnO film shows compact grains with average grain size of ~30nm, which are beneficial to the transportation of electrons. The Y₂O₃ film shows no significant grains.

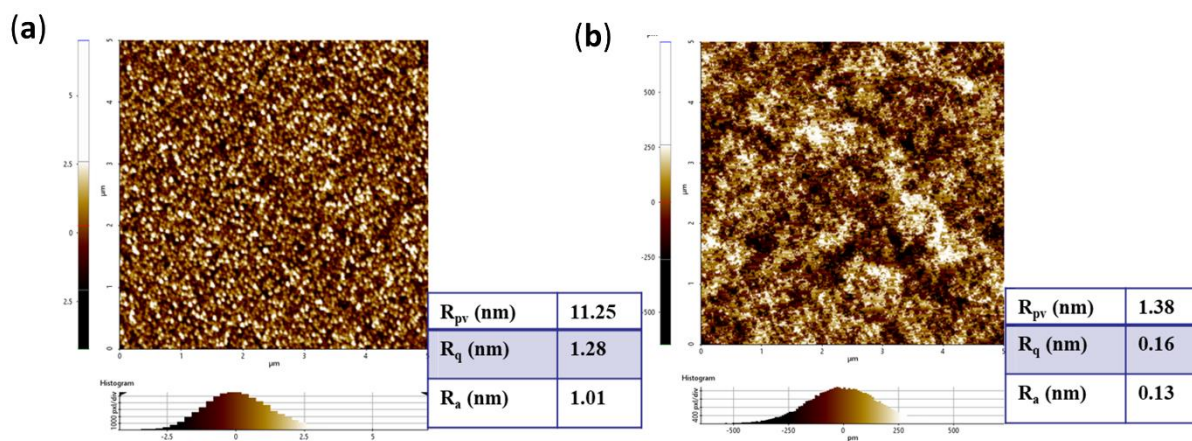


Figure S3. AFM image for surface roughness of spray coated (a) nano-crystalline ZnO film, and (b) amorphous Al_2O_3 film. Due to crystallinity, the root mean square roughness (R_{rms}) value of the ZnO film is 1.28 nm, whereas Al_2O_3 film with amorphous structure showing R_{rms} value of 0.16 nm.

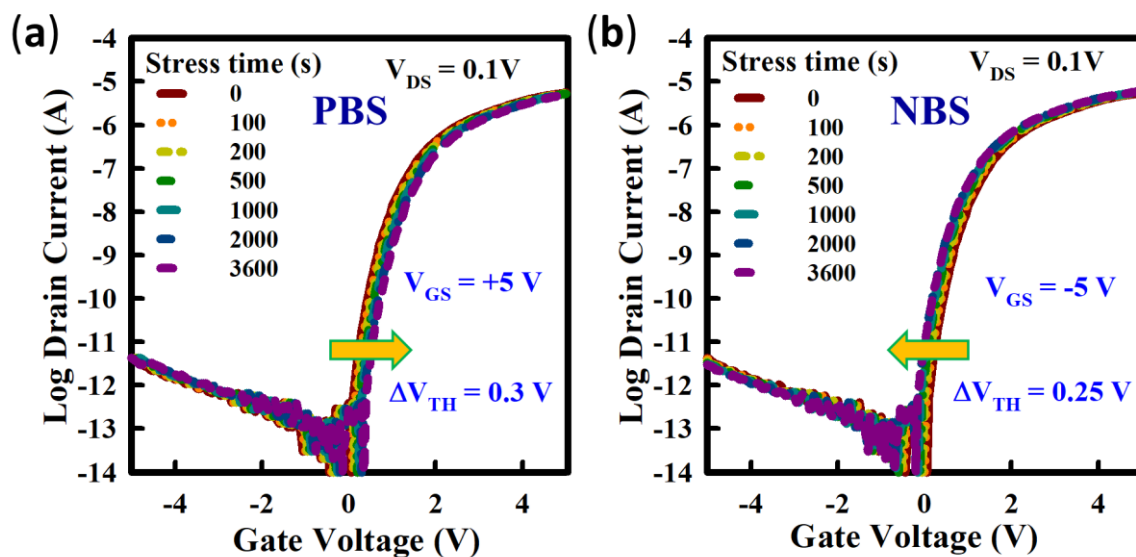


Figure S4: The evolution of transfer curve under bias stress for ZnO TFT without Y_2O_3 passivation. Transfer curves of ZnO TFTs under (a) PBS, and (b) NBS, measured by sweeping V_{GS} from -5 to +5 V at the drain voltage, $V_{DS} = 0.1$ V from 0 to 1 h.

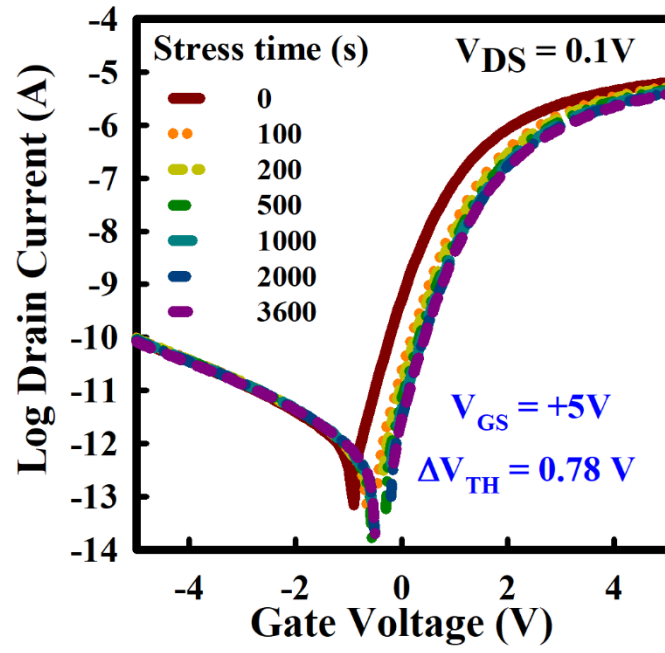


Figure S5. The evolution of transfer curve under positive bias temperature stress for ZnO TFT without Y_2O_3 passivation. The transfer curve of the TFT measured by sweeping V_{GS} from -5 to +5 V at the drain voltage, $V_{DS} = 0.1 \text{ V}$ for 1 h. The temperature stress was applied at $T = 60^\circ\text{C}$.

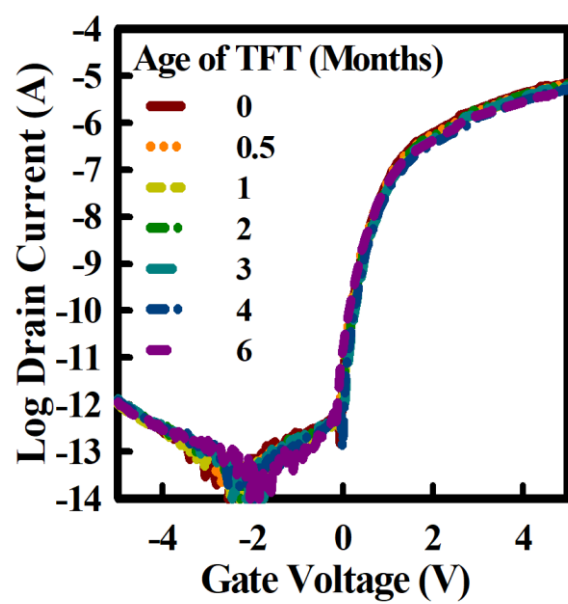


Figure S6: The evolution of transfer curve of Y_2O_3 passivated ZnO TFT in ambient air for long term stability. The transfer curve of the TFT measured by sweeping V_{GS} from -5 to +5 V at the drain voltage, $V_{DS} = 0.1\text{V}$.