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

Supporting Information for

Synergistic Combination of Amorphous Indium Oxide with Tantalum Pentoxide for Efficient Electron Transport in Low-Power Electronics

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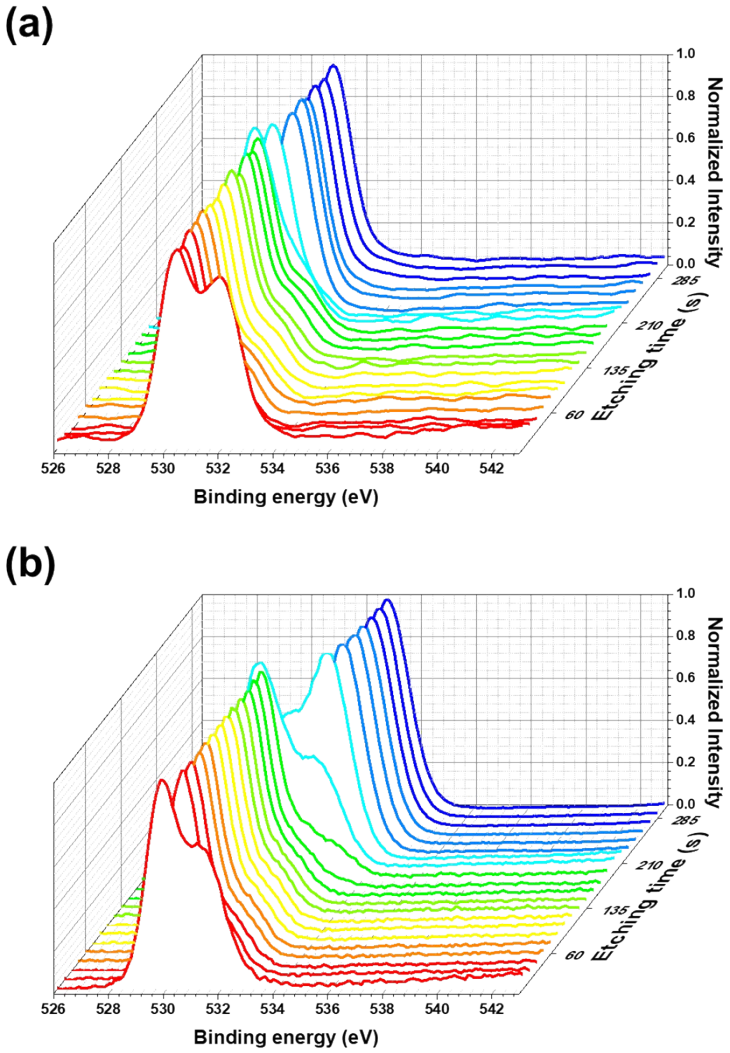

Fig. S1. O1s depth profile of (a) Ta_2O_5/In_2O_3 thin film stack and (b) SiO_2/In_2O_3 thin film stack in which the In_2O_3 layer was annealed at 300 °C for 5 minutes and 1 hour, respectively.

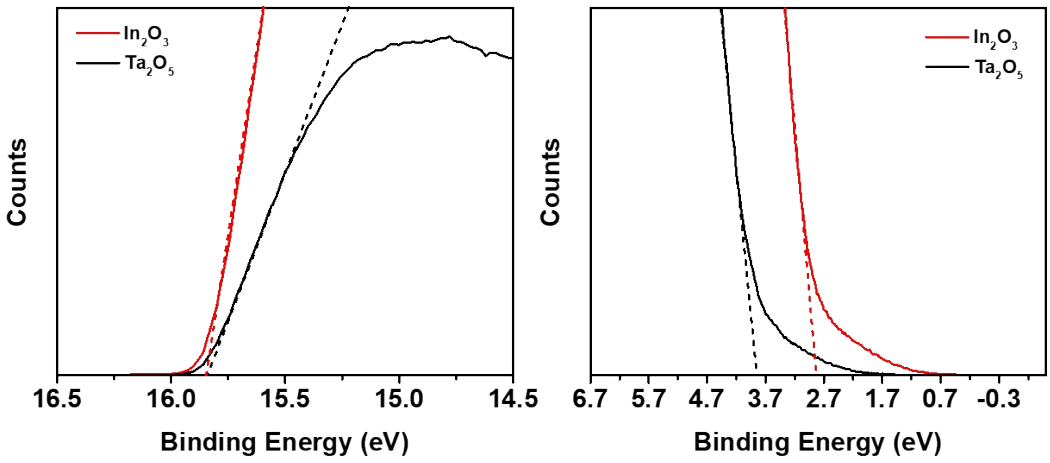

Fig. S2. Ultraviolet photoelectron spectra (UPS) of In_2O_3 and Ta_2O_5 thin films prepared on ITO substrates (E_{WF} = 4.7 eV).

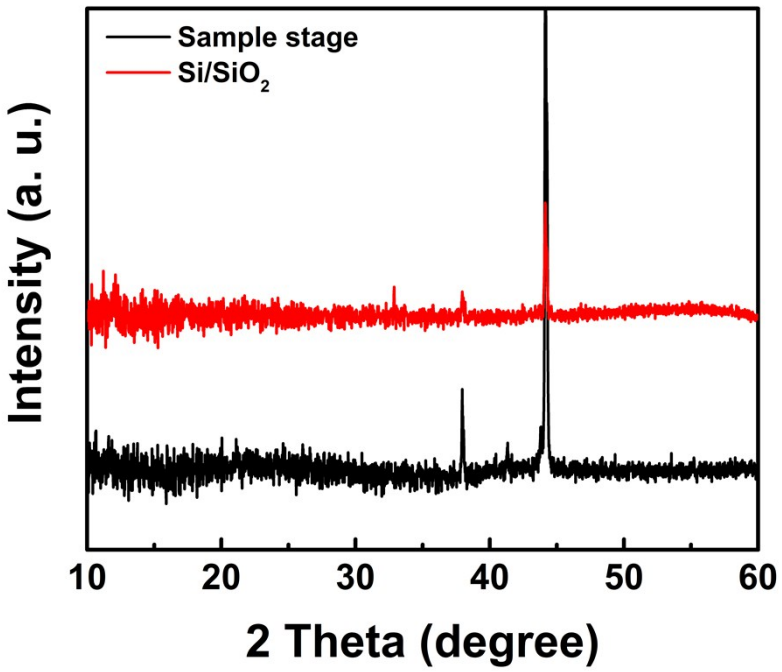

Fig. S3. XRD patterns corresponding to the sample stage and an Si/SiO_2 substrate.

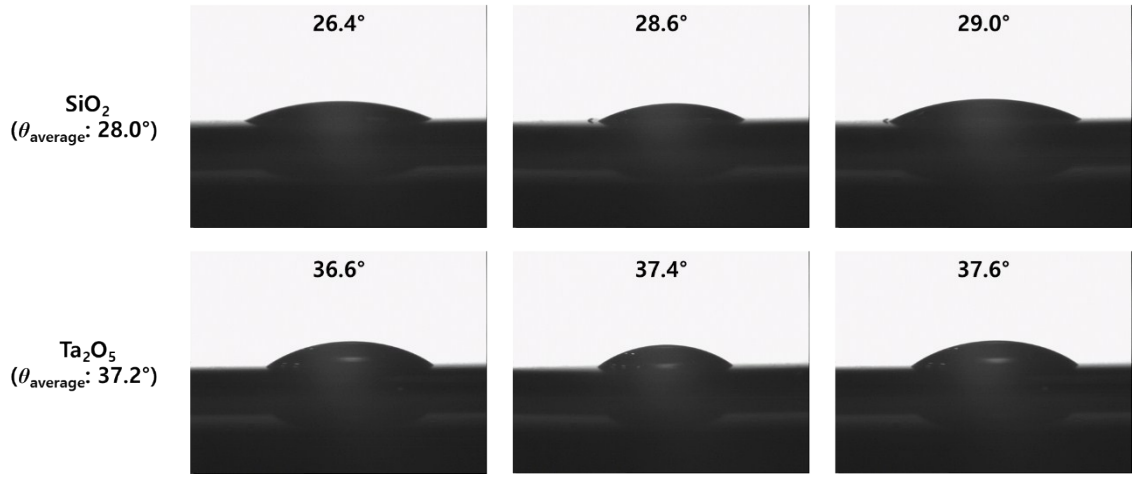

Fig. S4. Contact angles of 2-methoxyethanol droplets on dielectric (SiO_2 and Ta_2O_5) surfaces.

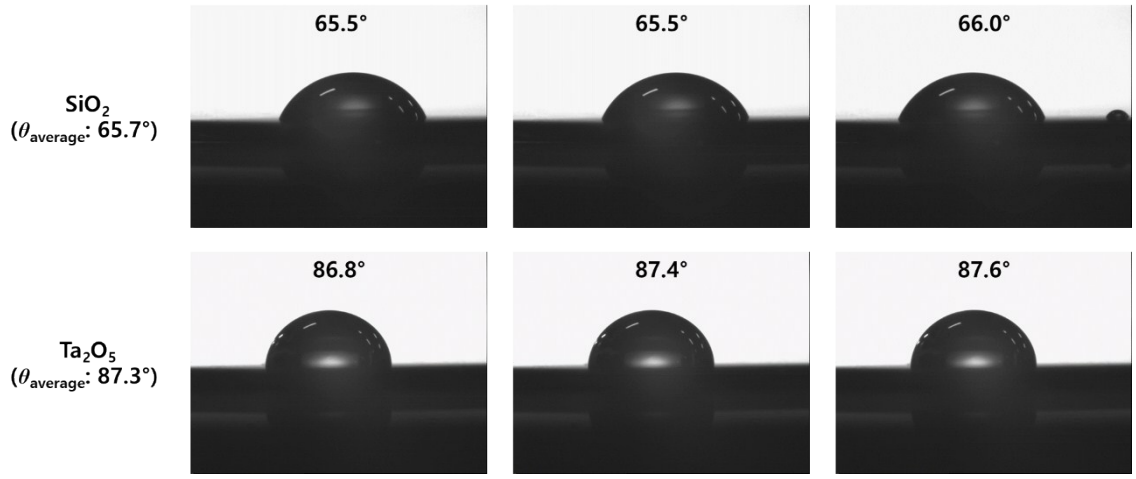

Fig. S5. Contact angles of water droplets on dielectric (SiO_2 and Ta_2O_5) surfaces.

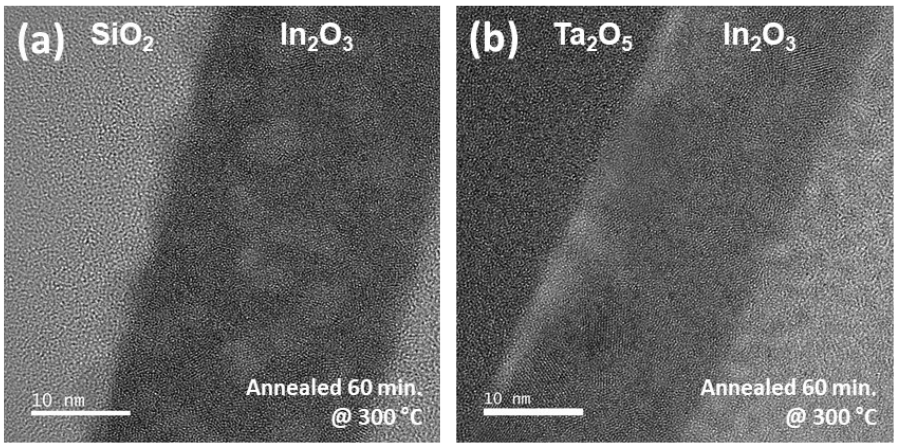

Fig. S6. High-magnification, cross-sectional TEM images of (a) SiO_2/In_2O_3 and (b) Ta_2O_5/In_2O_3 samples annealed for 60 minutes at 300 °C.

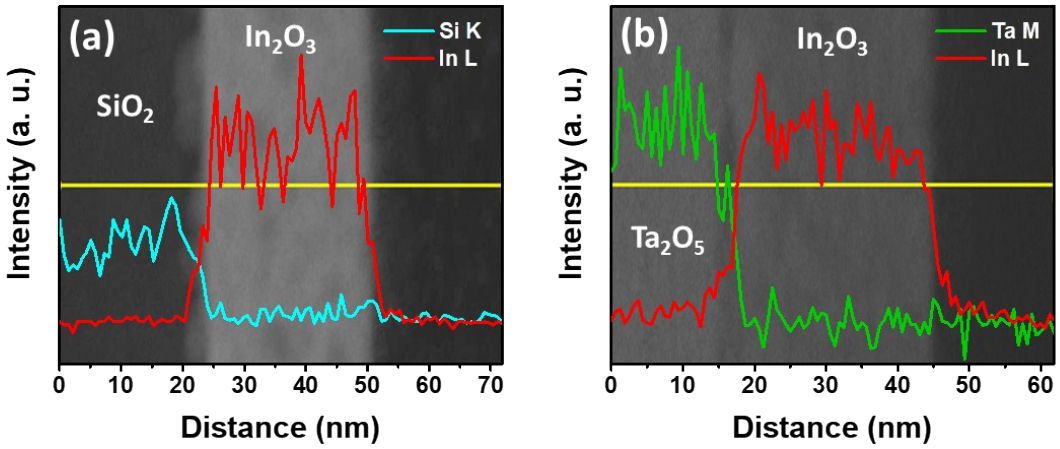

Fig. S7. Energy-dispersive X-ray spectroscopy (EDS) line profiles of (a) SiO_2/In_2O_3 and (b) Ta_2O_5/In_2O_3 samples. Background images are corresponding scanning TEM (STEM) images.

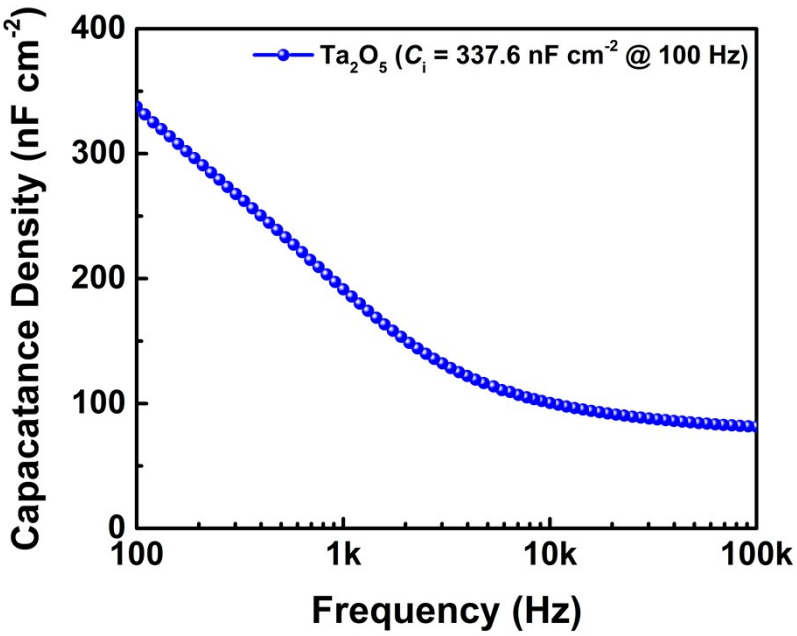

Fig. S8. Capacitance density – frequency (*C-f*) curve of Ta_2O_5 dielectric layer

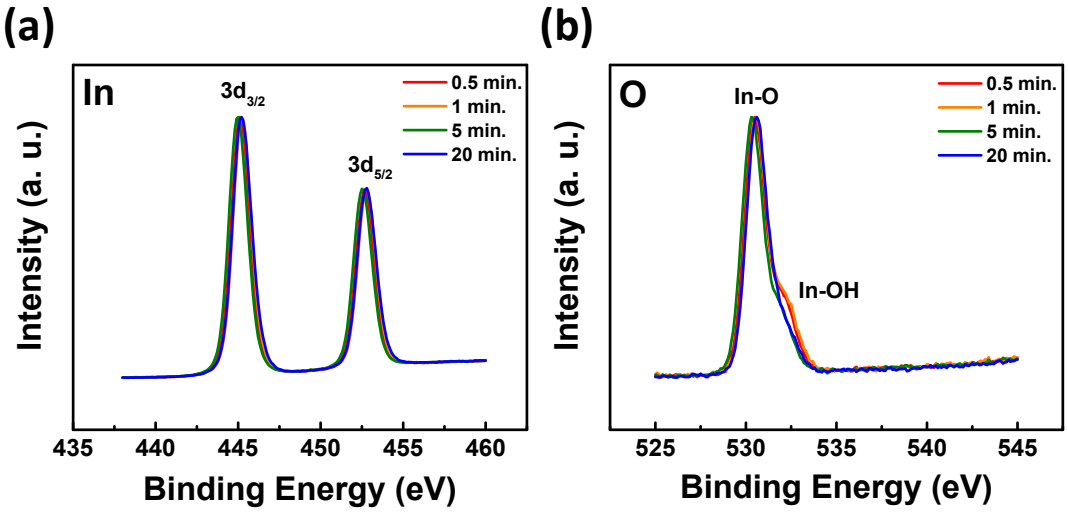

Fig. S9. XPS spectra for In_2O_3 films for In 3d and O 1s with various annealing time.

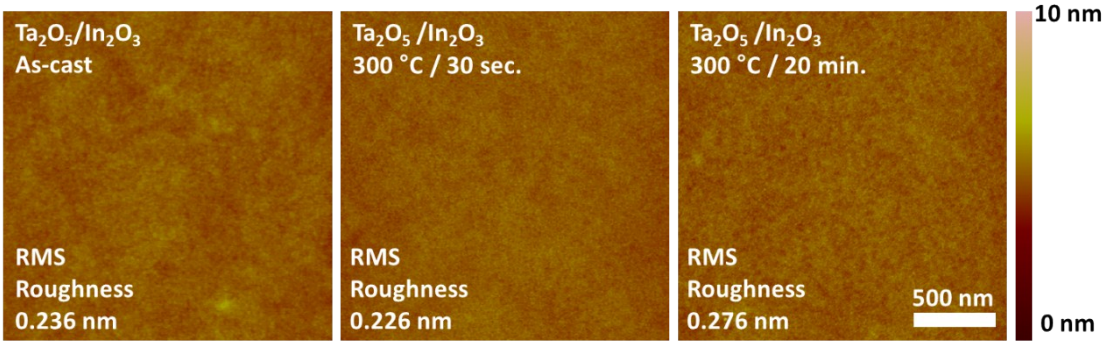

Fig. 10. AFM topographical images for Ta_2O_5/In_2O_3 films with different annealing time

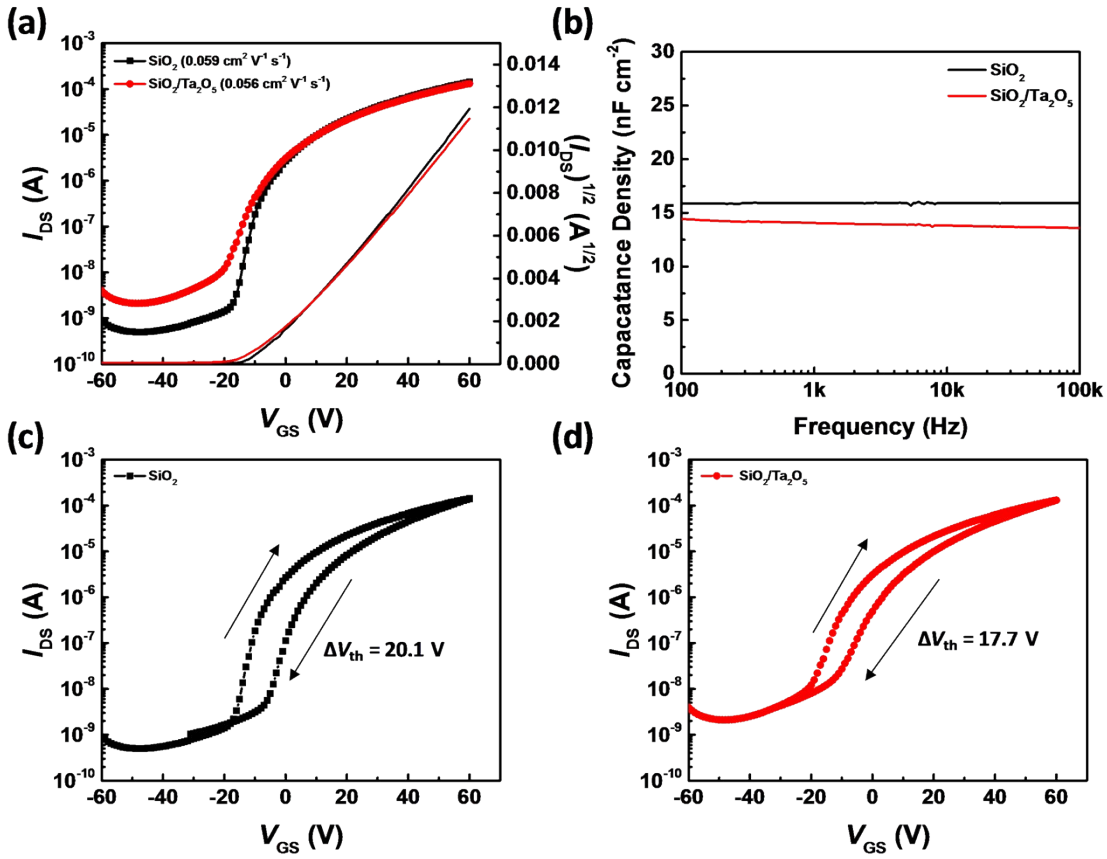

Fig. S11. (a) Transfer curves of In_2O_3 TFTs with different dielectric; SiO_2 and SiO_2/Ta_2O_5. Both devices were fabricated with annealing at 300 °C for 5 minutes, to avoid damage of Ta_2O_5 layer during annealing process. (b) Capacitance – frequency curves for SiO_2 and SiO_2/Ta_2O_5. (c, d) Hysteresis curves for SiO_2 and SiO_2/Ta_2O_5 devices, respectively.

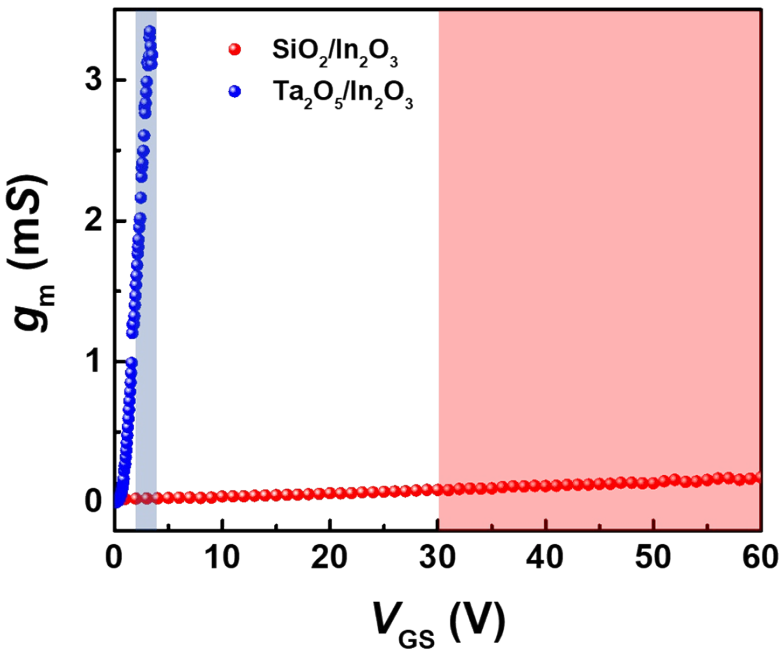

Fig. S12. Transconductance, g_m versus V_{GS} of two devices. The values were acquired from the curves shown in **Fig. 4a** and **4c**. Shaded area indicates the region where field effect mobilities of the devices are constant.

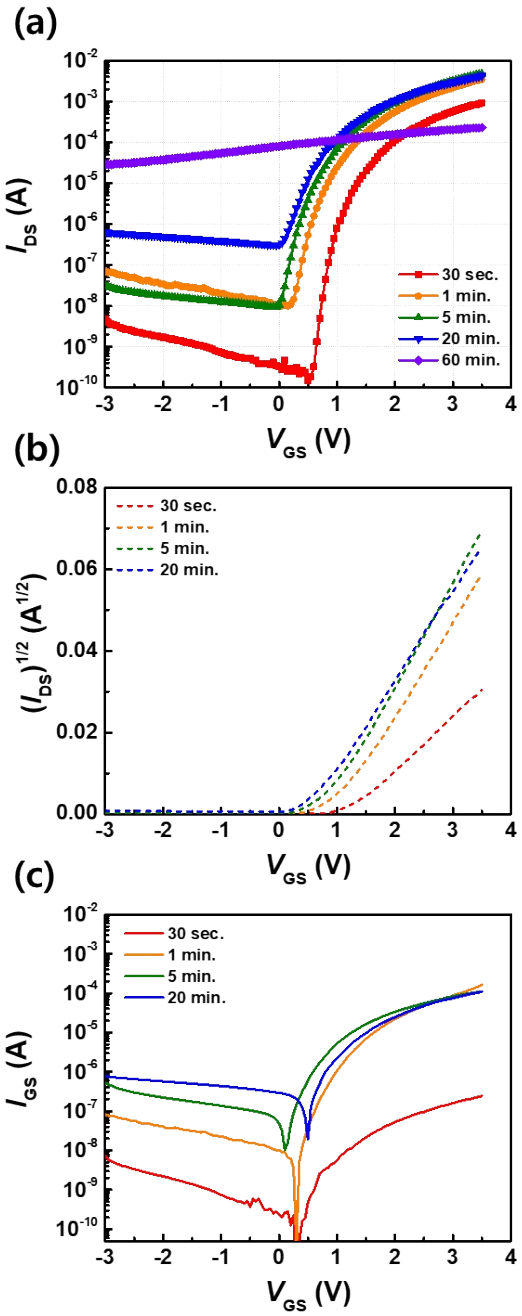

Fig. S13. (a) Transfer, (b) output and (c) gate leakage current characteristics of Ta_2O_5/In_2O_3 TFTs annealed for various lengths of time.

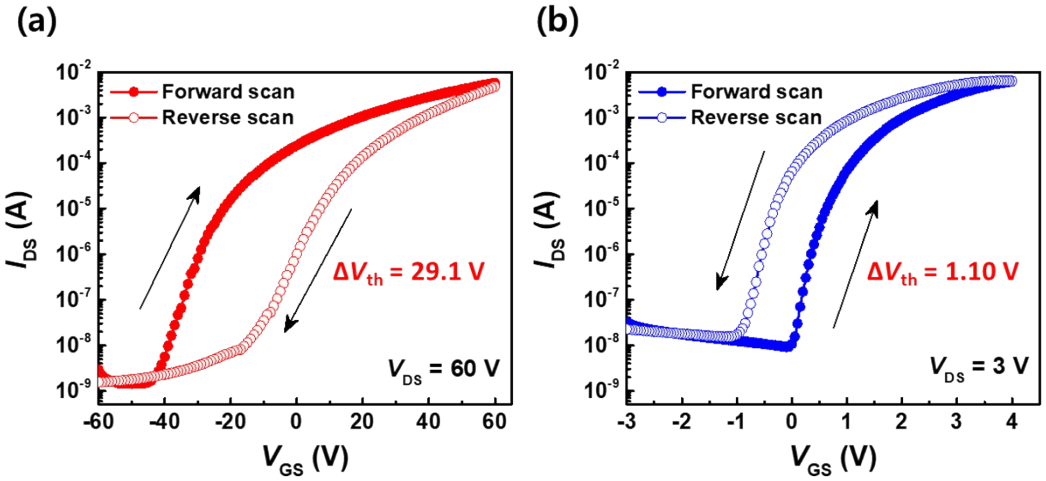

Fig. S14. Hysteresis characteristics for (a) SiO_2/In_2O_3 and (b) Ta_2O_5/In_2O_3 TFTs.