

Electronic Supplementary Information (ESI)

Synaptic Transistors with Human Brain-Like fJ Energy Consumption via Double Oxide Semiconductors Engineering for Neuromorphic Electronics

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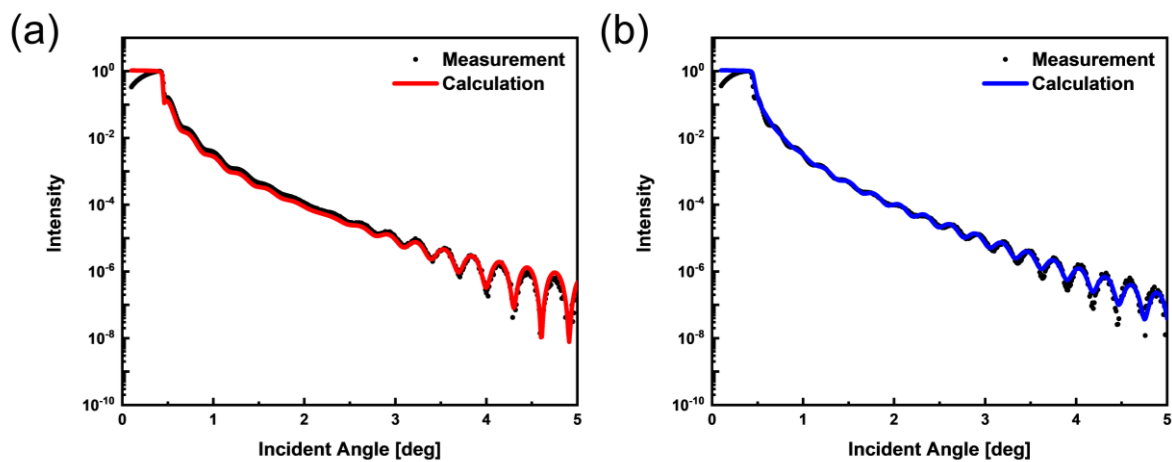


Fig. S1 XRR results of PEALD SiO₂ deposited at (a) 200 and (b) 300 °C.

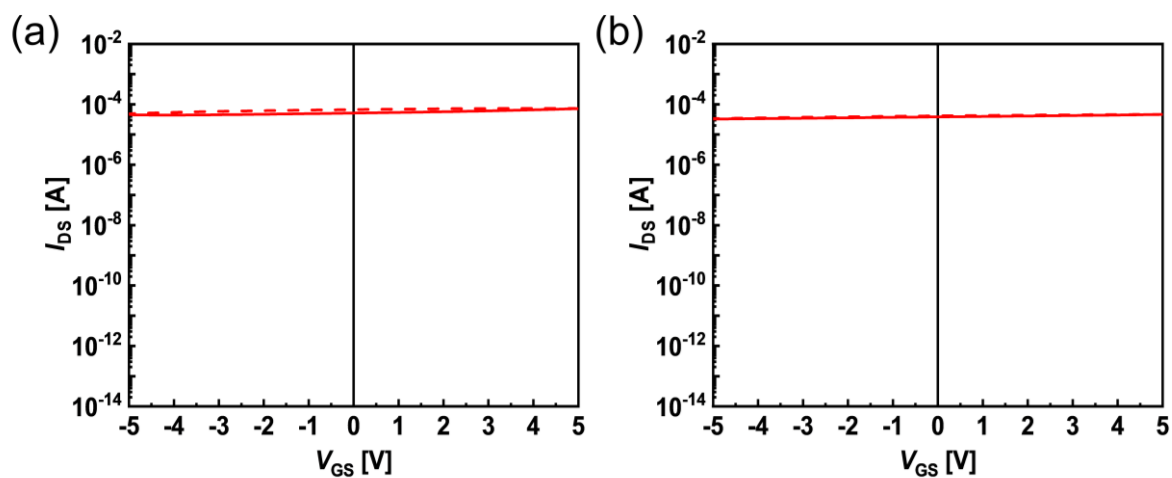


Fig. S2 Transfer curves of top-gate IZO TFTs with (a) 30 nm and (b) 60 nm of PEALD SiO₂ GI deposited at 200 °C without H barrier. ($V_{DS} = 0.1$ V) Solid lines represent forward sweeps and dashed lines represent back sweeps.

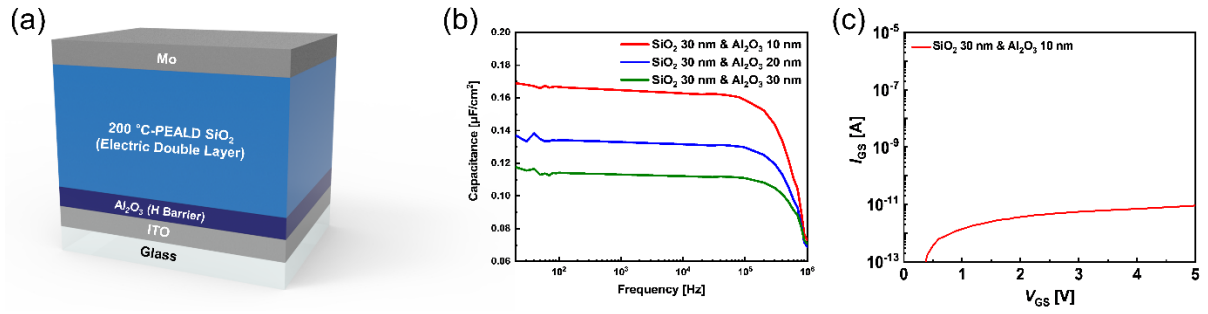


Fig. S3 (a) Schematic of MIM device with both a SiO₂ EDL and an Al₂O₃ H barrier. (b) Results of C-F measurements of these MIM devices. (c) Gate leakage current of synaptic transistor with 30-nm SiO₂ EDL and 10-nm Al₂O₃ GI.

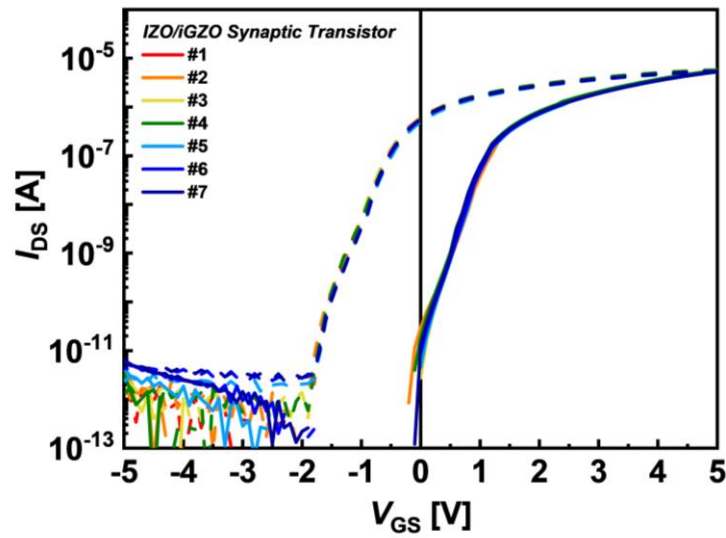


Fig. S4 Uniformity of transfer curves of IZO/IGZO synaptic transistors ($V_{DS} = 0.1V$). Solid lines represent forward sweeps and dashed lines represent back sweeps.

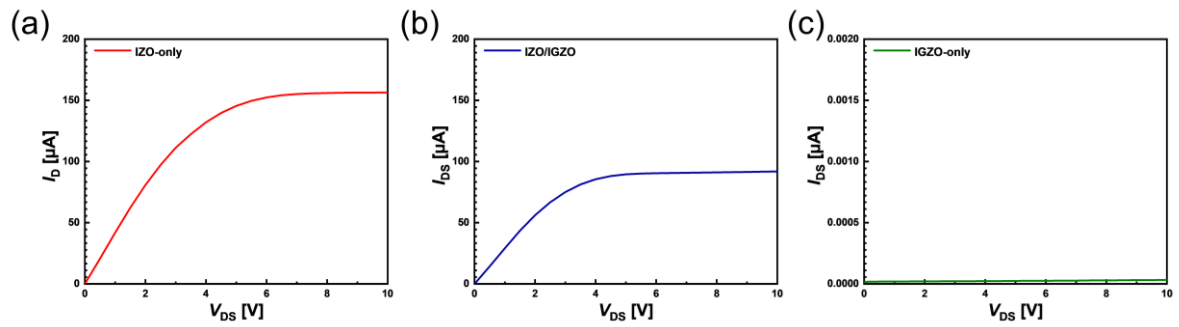


Fig. S5 Output curves of (a) IZO-only, (b) IZO/IGZO, and (c) IGZO-only synaptic transistor ($V_{GS} = 3.5$ V).

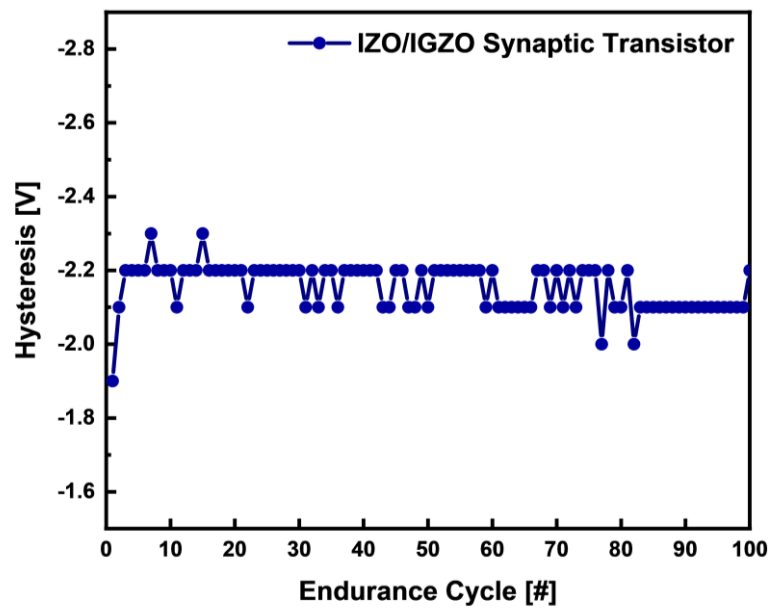


Fig. S6 Hysteresis window of IZO/IGZO synaptic transistor according to the number of endurance cycles.