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

Supporting Information

Polyvinyl alcohol electrolyte gated oxide transistors with tetanization acitivities for neuromorphic computing

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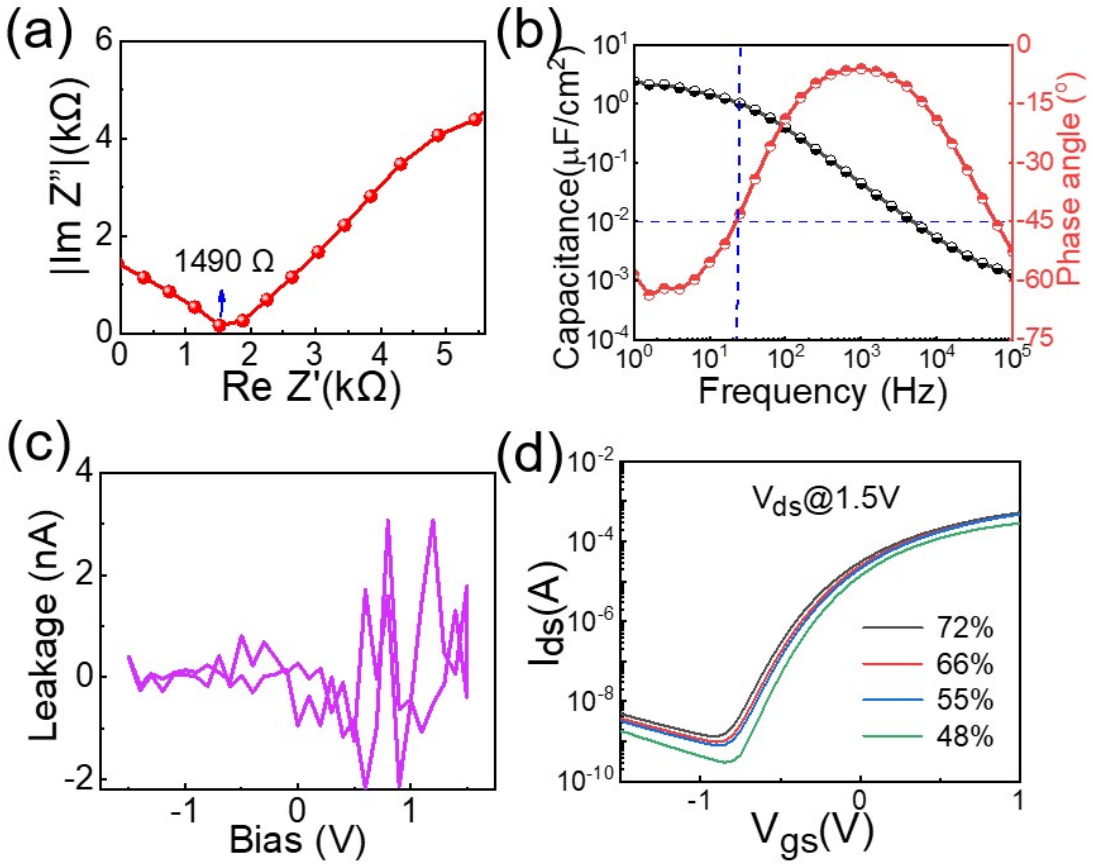

Figure S1 (a) Impedance spectroscopy data of PVA based electrolyte film. (b) Frequency-dependent specific capacitance and phase angle of PVA based electrolyte film as a function of frequency. It is observed that the specific capacitance decreases gradually with the increased frequency. A high specific capacitance of ~2.4 μF/cm^2 is obtained at 1.0 Hz. The phase angle also indicates proton migration characteristics. At low frequencies of <25 Hz, the phase angle is below -45°, indicating capacitance behavior. Protons driven by external electrical field have sufficient time to migrate to the PVA/ITO interface, resulting in the formation of electric-double-layer (EDL). At higher frequencies of above 25 Hz, protons cannot accumulate at the interface in time. This process can be attributed to ion relaxation, resulting in the resistance behavior with phase angle above -45°. (c) Leakage current of the PVA based electrolyte film. (d) Humidity dependent transfer curves at V_{ds} of 1.5V. The results indicate strengthened proton gating effects at high humidity.

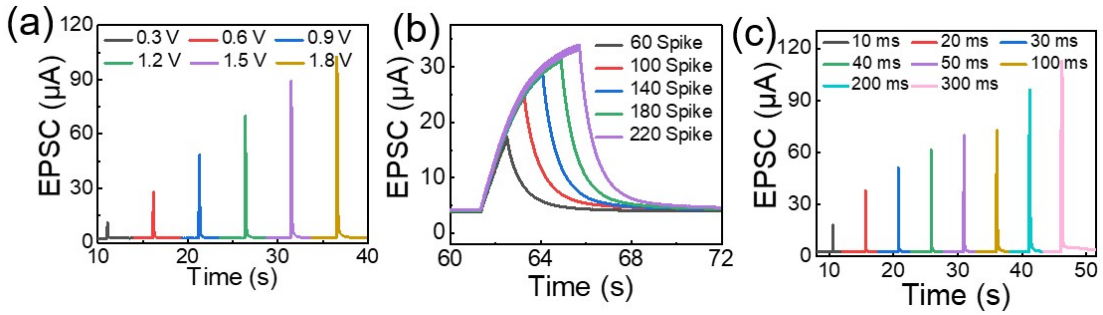

Figure S2 (a) Spike amplitude dependent EPSC. Spike duration is 10 ms. (b) Spike number dependent EPSC. Spike: (1 V, 10 ms). (c) Spike duration dependent EPSC. Spike amplitude is 1V. EPSC is detected with constant V_{ds} of 0.5 V.

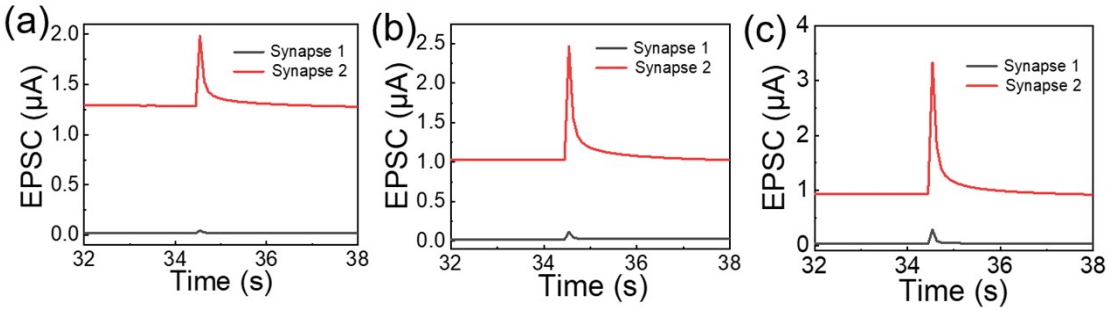

Figure S3. EPSC responses of synapse 1 and synapse 2 triggered with gate spikes (a) (0.5 V, 10 ms), (b)(1.0 V, 10 ms) and (c)(1.5 V, 10 ms).

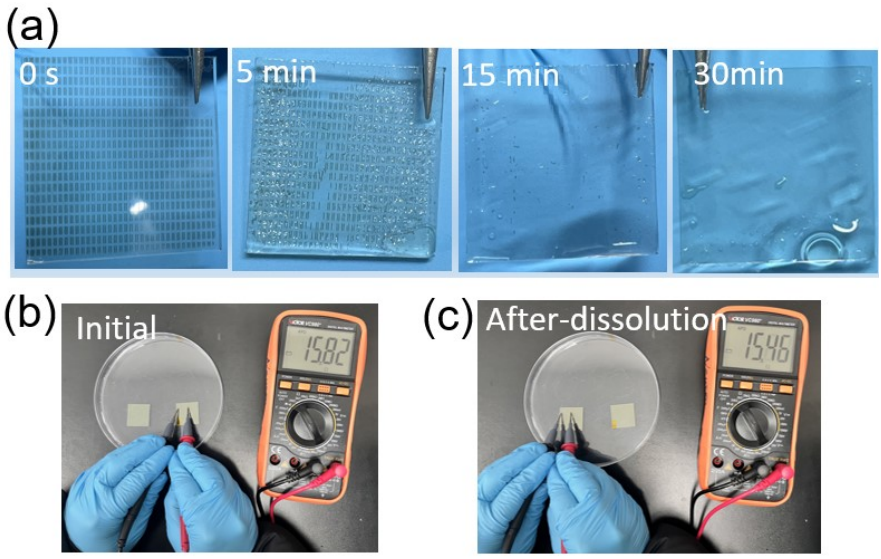

Figure S4. (a) Dissolution process of the PVA gated ITO neuromorphic transistors in boiled DI water. (b) Resistance of initial ITO glass substrate. (c) Resistance of ITO glass substrate after dissolution of transistors.