Supporting Information

MXene-based optoelectronic synaptic transistors utilize attentional mechanisms to achieve hierarchical responses

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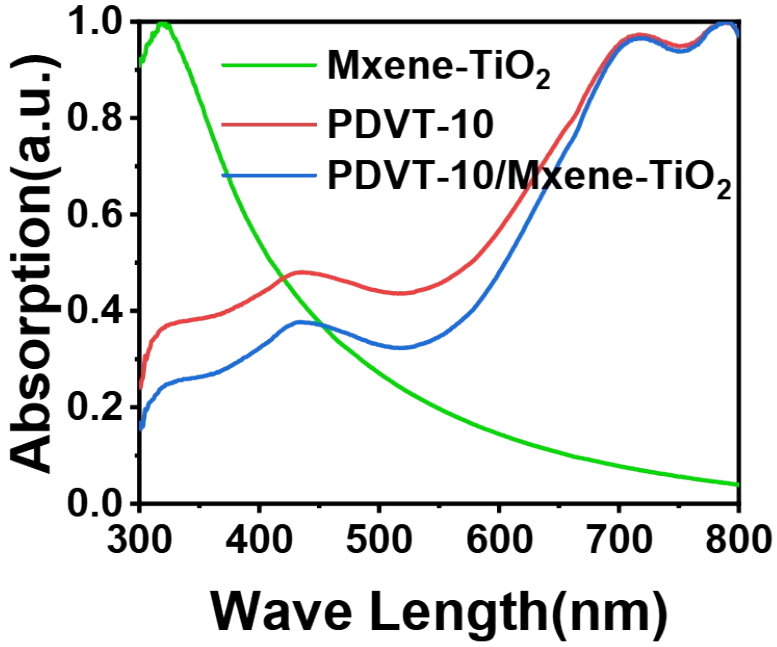

Fig.S1. Absorption spectra of pure semiconductor PDVT-10 and MXene-TiO_2 and mixtures of PDVT-10/MXene-TiO_2.

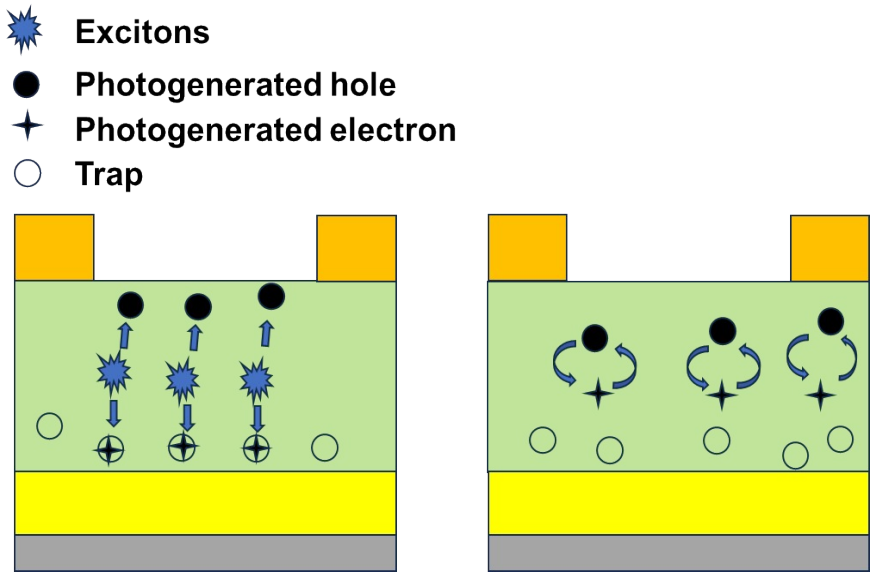

Fig.S2. The schematic diagram of photosynaptic behavior. When stimulated by light pulses, PDVT-10 produces photogenerated excitons, namely photogenerated electron photogenerated hole pairs. The photo generated electrons are trapped, and the photogenerated holes accumulate in the channel, resulting in transient changes in the channel current. After removing the light pulse stimulation, the trap releases photogenerated electrons into the channel, the photogenerated electrons and photogenerated holes recombine, and the channel current returns to the original state.

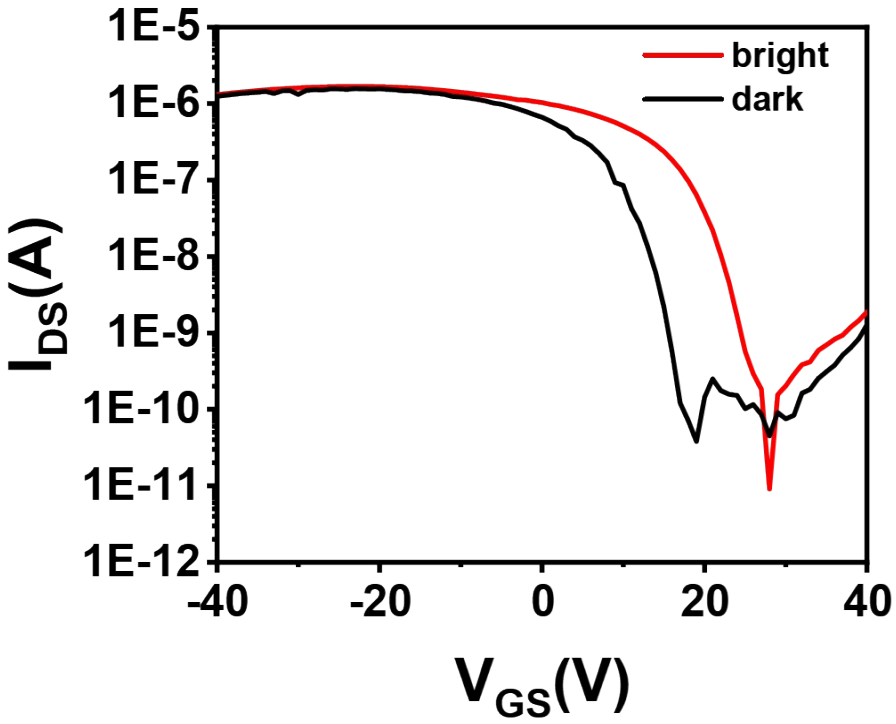

Fig.S3. Transfer characteristic curves of devices under dark and light conditions.

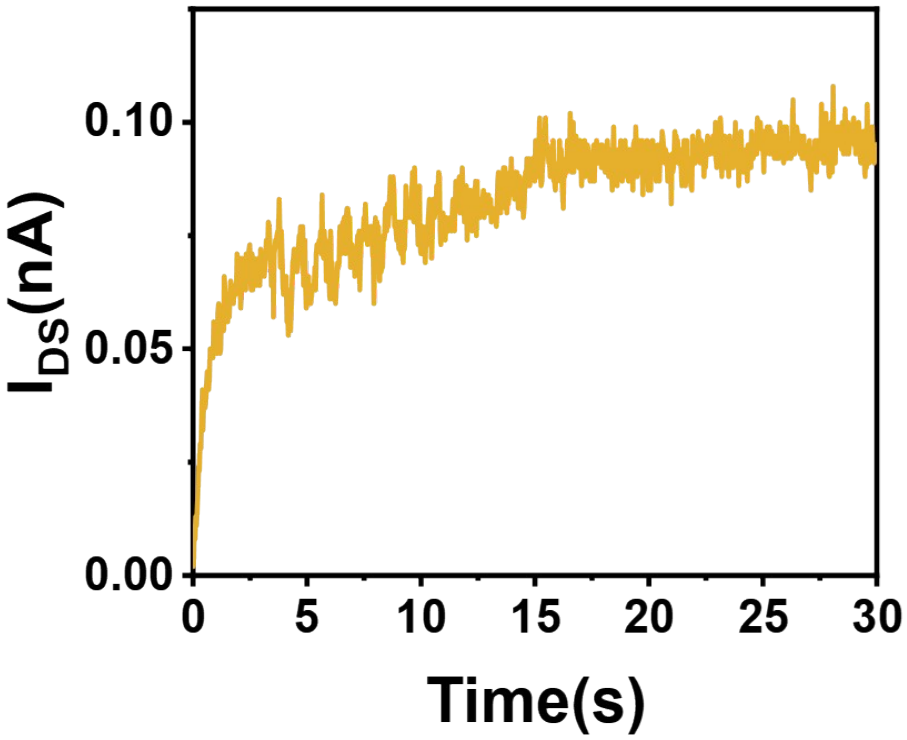

Fig.S4. The synaptic structure of pure PDVT-10 shows no response under ten light pulses.

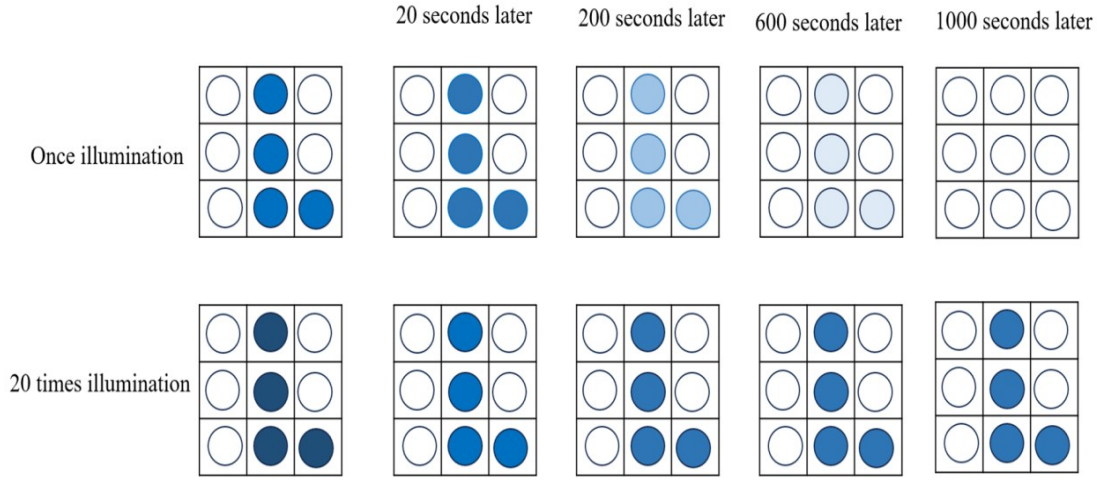

Fig.S5. Application of transformation from STM to LTM .

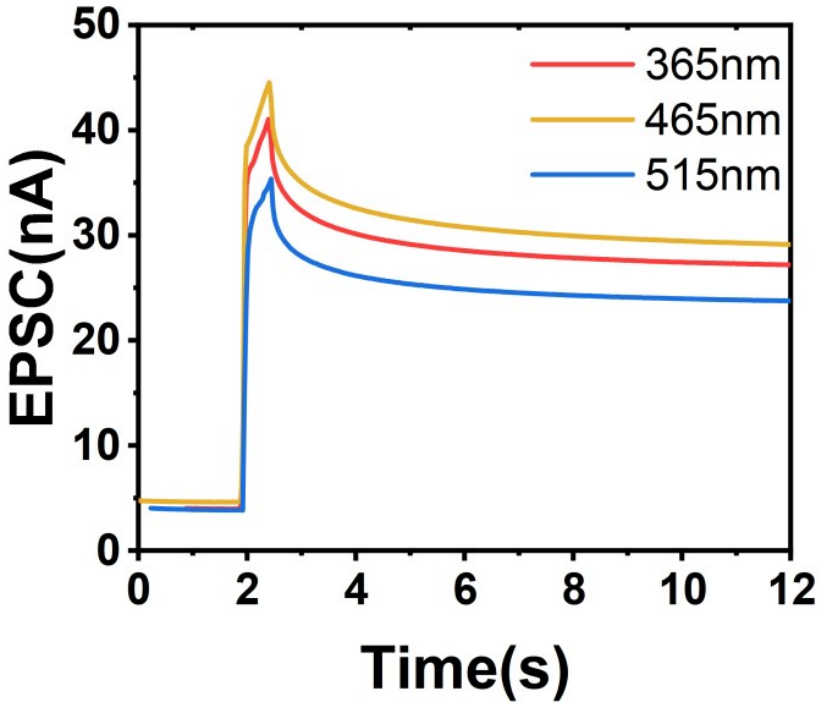

Fig.S6. EPSC of single optical pulse with different wavelength.

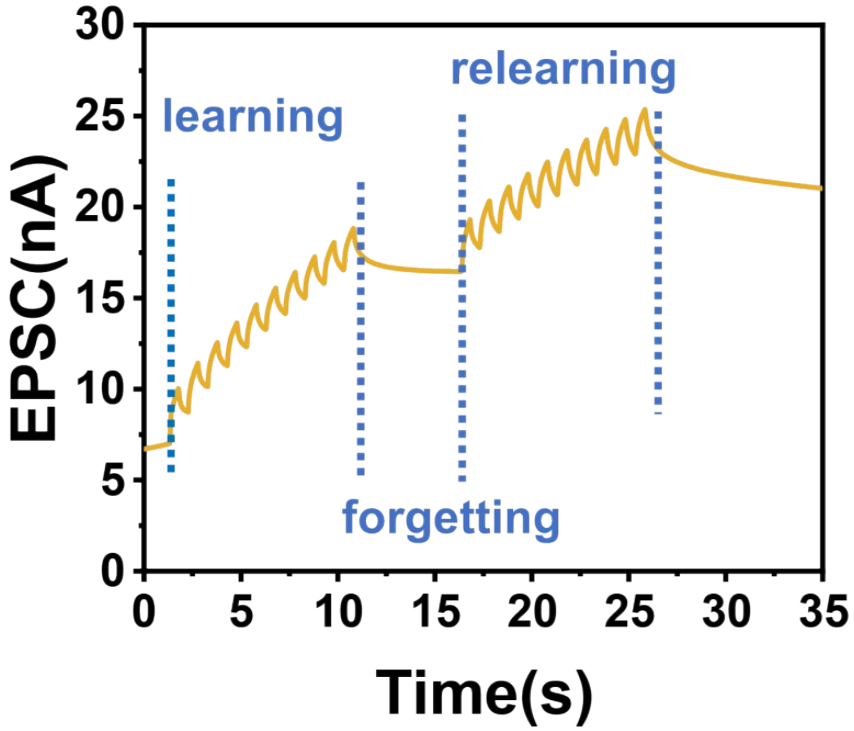

Fig.S7. Learning forgetting remembering curve.

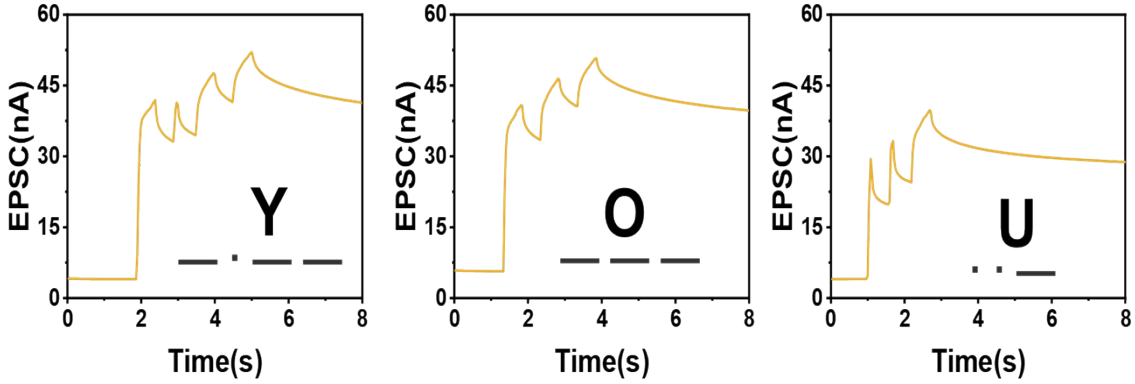

Fig.S8. Postsynaptic current corresponding to "YOU" Morse code.

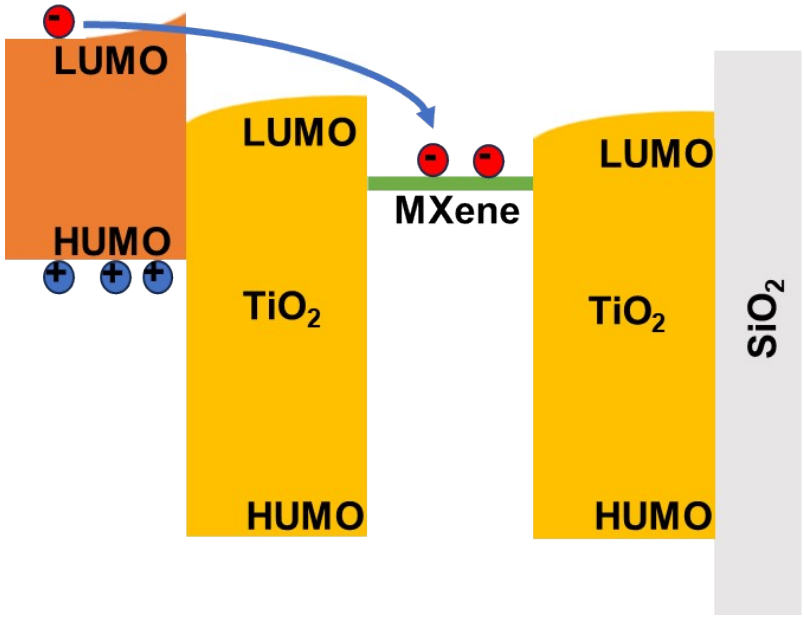

Fig.S9. Energy band diagram when grid voltage is applied.

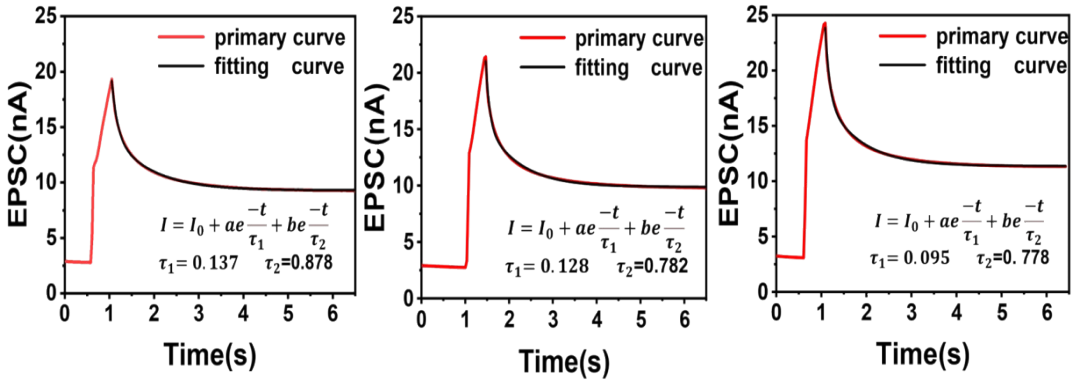

Fig.S10. Decay time constant at different gate voltages(0.5V, 1V, 1.5V).

Fig.S11. Recognition effect diagram of YOLO network. The prediction box is the object we tracked. The prediction box shows the type of object identified and the probability of accurate recognition.

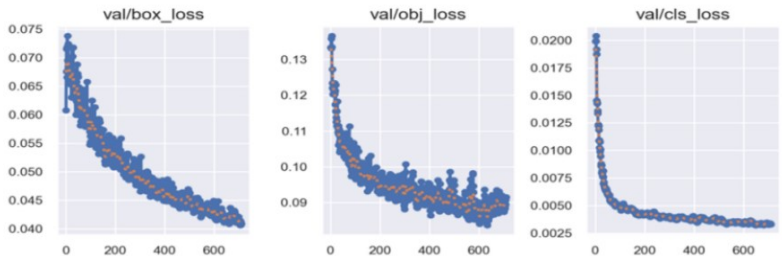

Fig.S12. Indicators of output results of YOLO network.

box_ loss: box regression loss, which is used to measure the difference between the predicted box position and the real box position in the target detection model. The lower the box_ loss, the smaller the difference between the predicted box and the real box.

obj_ loss: target confidence loss, which is used to measure the accuracy of target judgment in the target detection model. The lower the obj_ loss, the higher the accuracy of judgment.

class_ loss: category classification loss, which is used to measure the classification accuracy of different categories in the target detection model. The lower the class_ loss, the higher the accuracy of distinguishing different categories.