

**Ultraviolet-driven metal oxide semiconductor synapses with  
improved long-term potentiation**

**Supporting Information**

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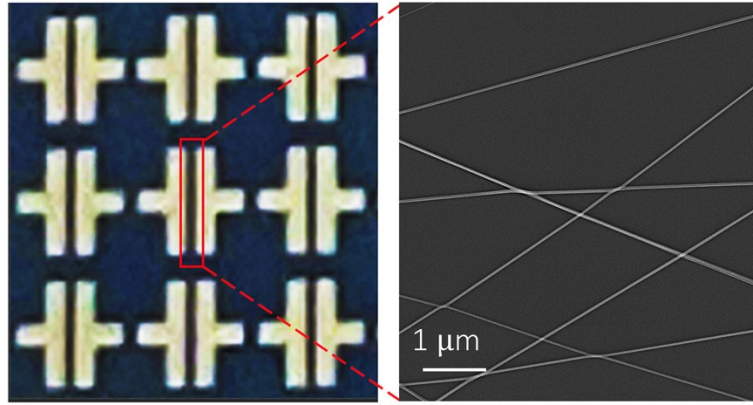
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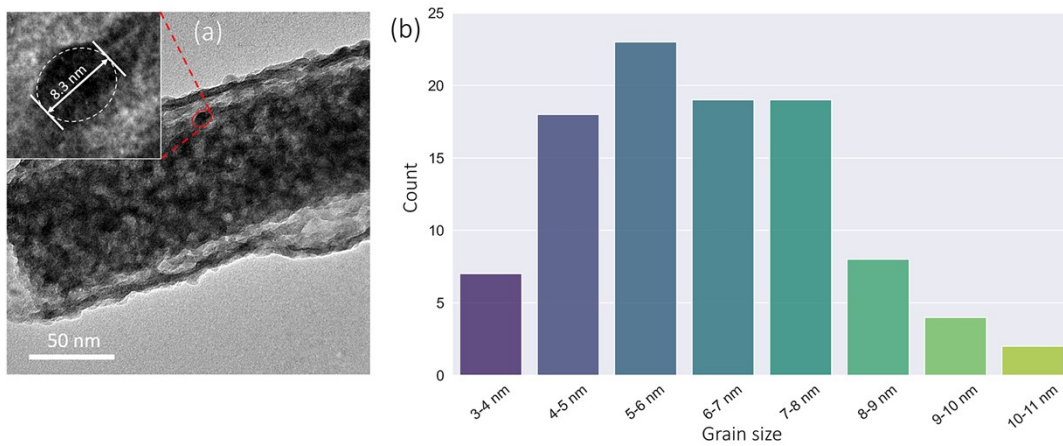
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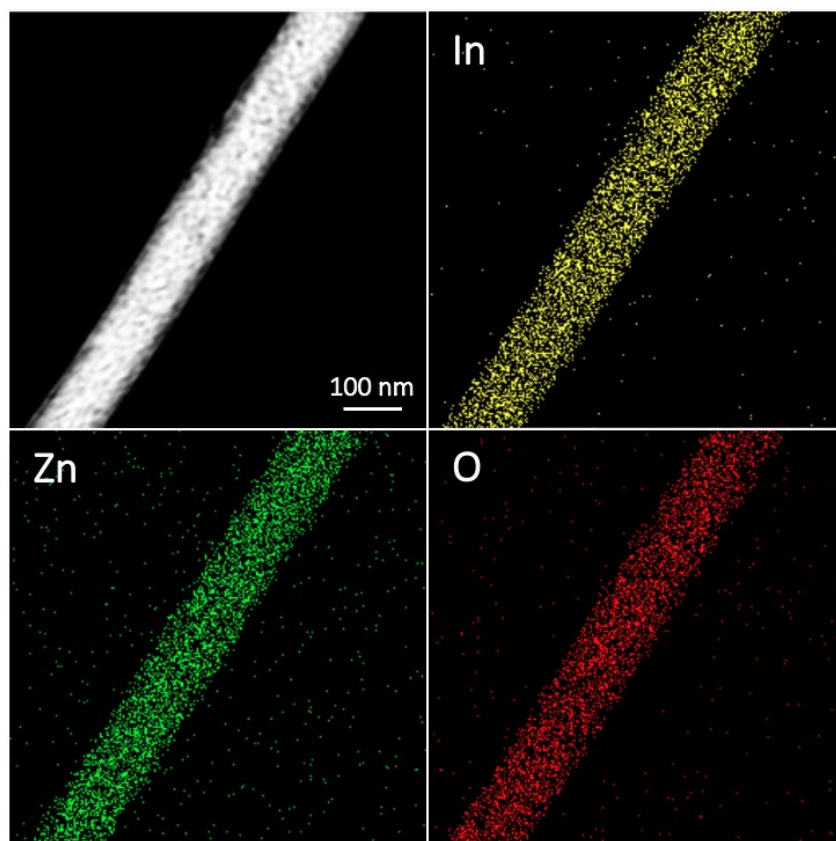
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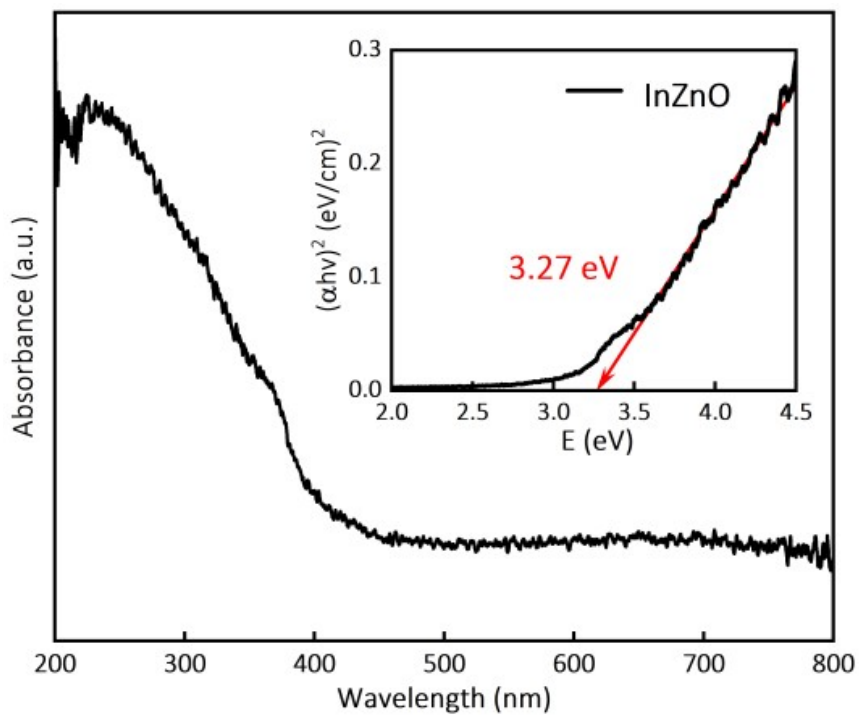
**Fig. S1** Optical image of a  $3 \times 3$  array of InZnO nanowire synaptic transistors. Inset: zoomed-in SEM image of the transistor channel area marked by a red rectangle.



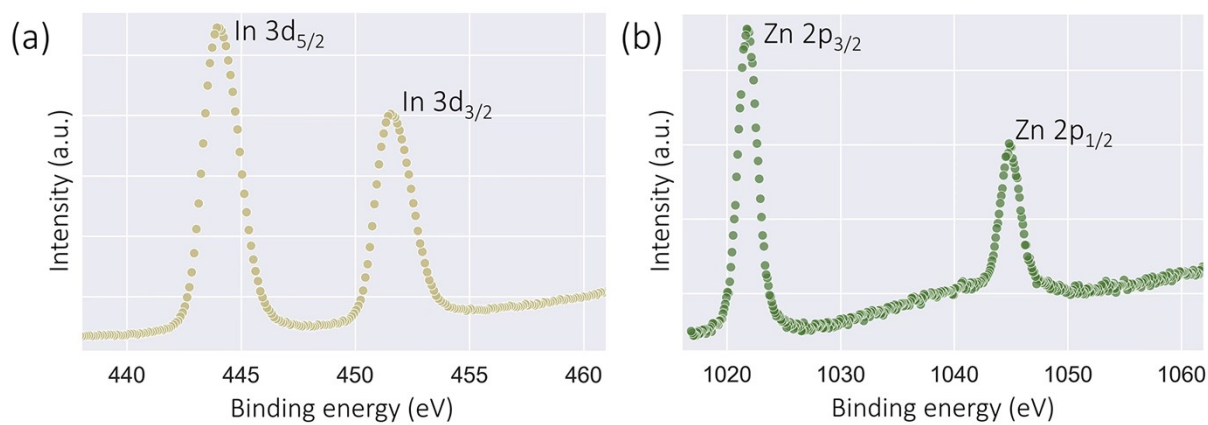
**Fig. S2** (a) HRTEM image showing an exemplified grain with grain size of approximately 8.3 nm. (b) The number distribution of one hundred different grain size in the corresponding HRTEM image illustrated in Fig. S2a.



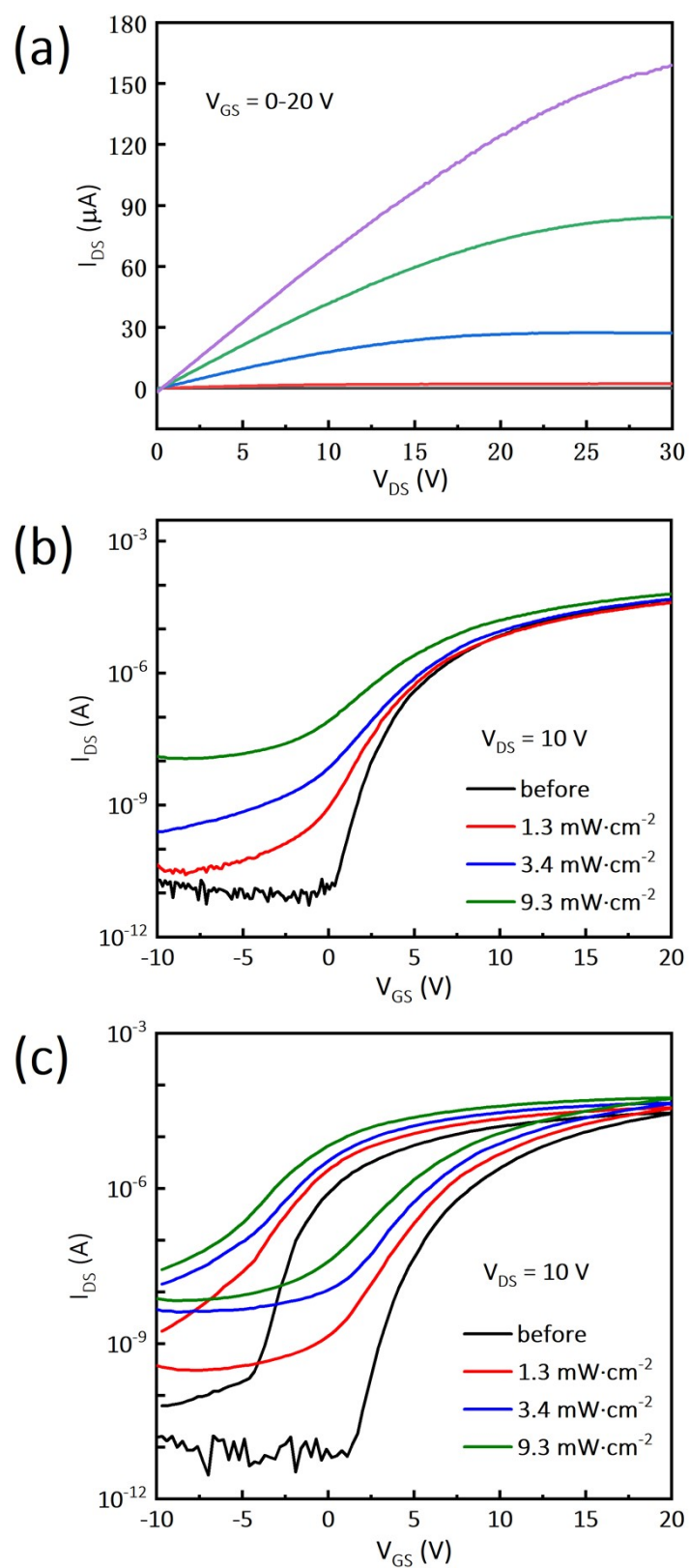
**Fig. S3** EDS elemental mapping of In, Zn, and O atoms.



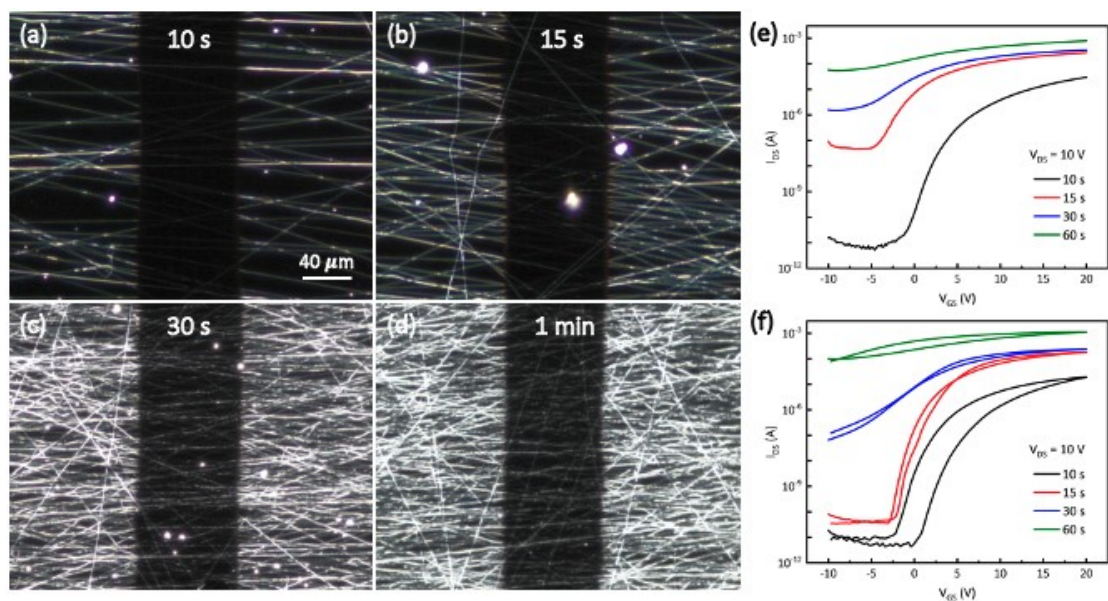
**Fig. S4** UV-vis spectrum of InZnO nanowires. Inset: Tauc plot to estimate optical bandgap.



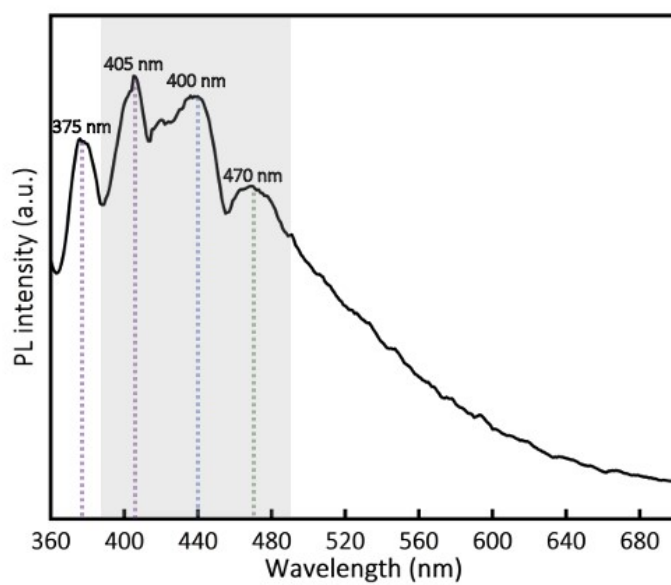
**Fig. S5** XPS spectra of (a) In 3d, (b) Zn 2p in InZnO.



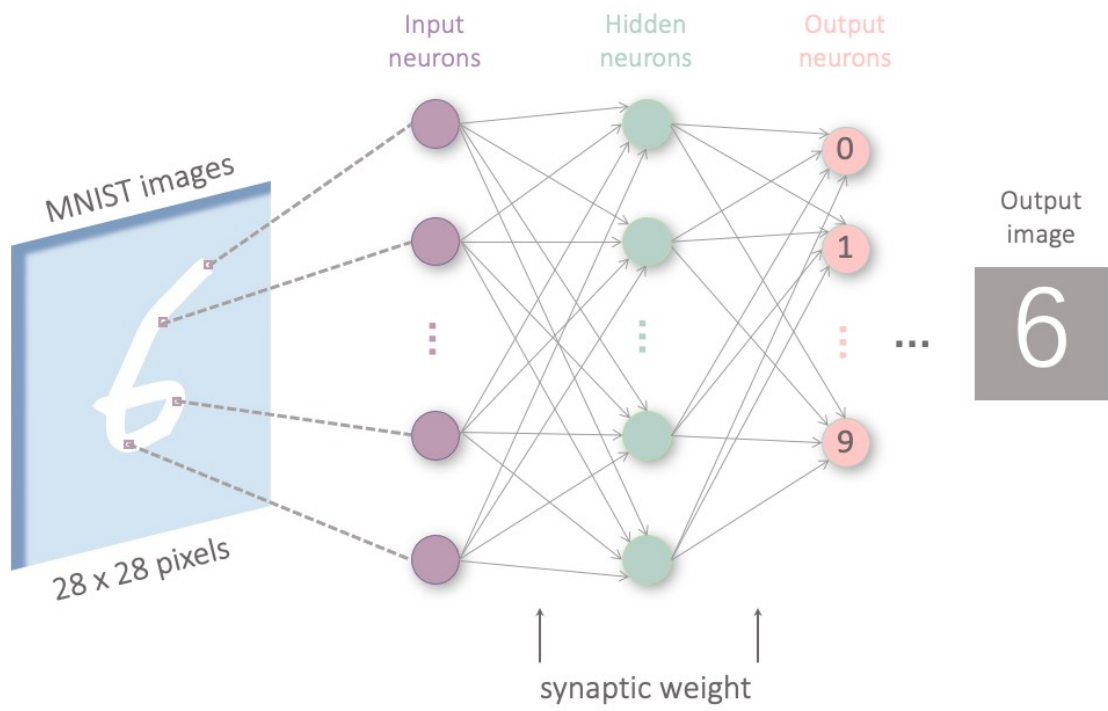
**Fig. S6** (a) Output characteristic curve of the InZnO transistor. Transfer curves (b) and dual sweep of the transfer curves (c) based on the InZnO transistor with and without light illumination.



**Fig. S7** Optical diagram with different spinning time of 10 s (a), 15 s (b), 30 s (c) and 1 min (d). Single (e) and dual (f) sweep transfer curves of the InZnO transistor at different spinning time.



**Fig. S8** PL spectrum of the InZnO sample.



**Fig. S9** Schematic illustration of artificial neural network for hand-written recognition.