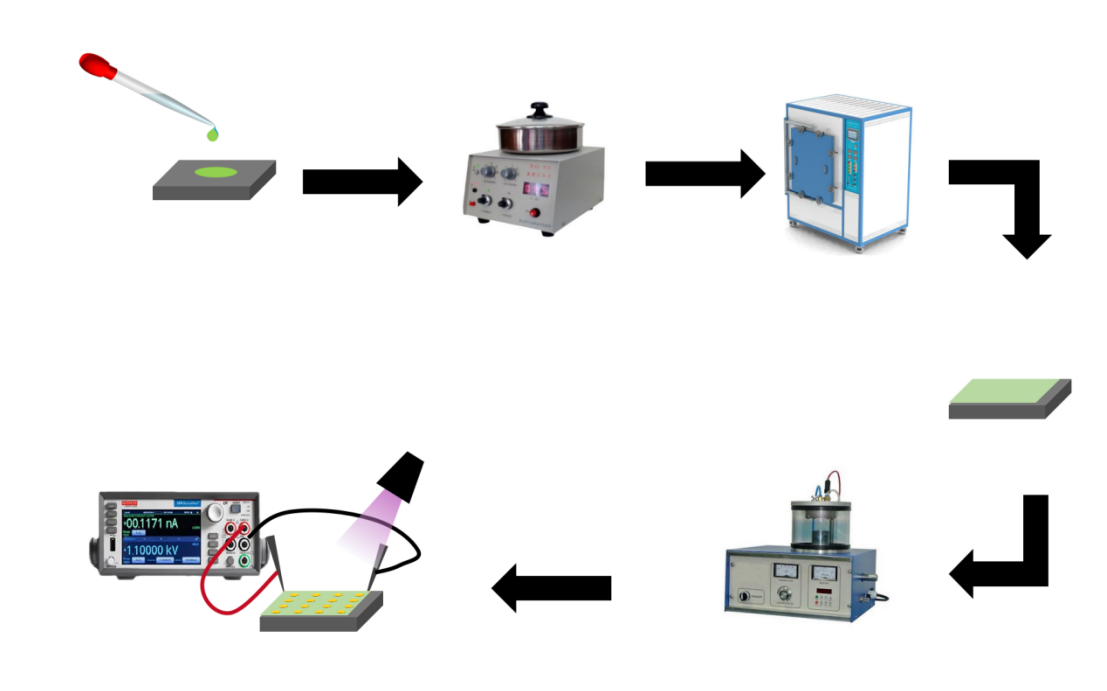# Supporting Information
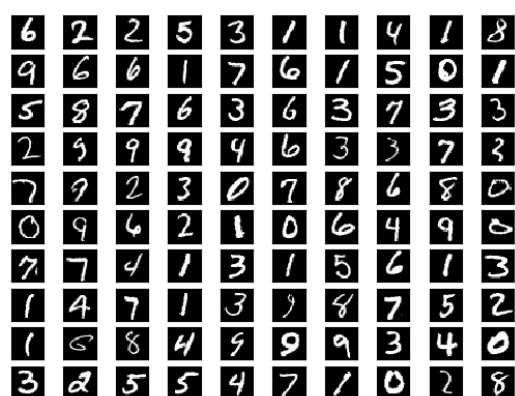
Note 1. Preparation process of thin film devices

Figure S1. The overall preparation process of thin film devices

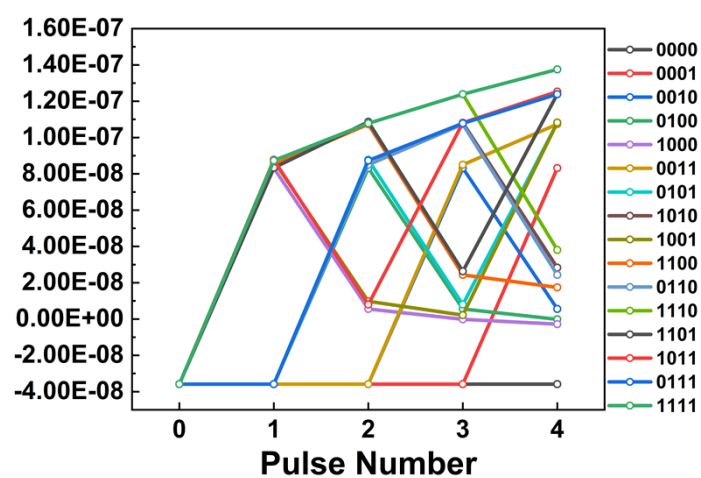## Note 2. Neuromorphic calculation of device

Figures S2 show handwritten digit sets for neural network recognition tests.

Figure S2. Handwritten digit set for testing.

Note 3.16 states of the device excited by 365 nm light

Figure S3. The device excites 16 different conduction states under the combined pulse of 365 nm light.