

## Artificial Van der Waals Synapse based on Tungsten Disulfide (WS<sub>2</sub>) for Pattern Recognition

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TM-P006

## Artificial Van der Waals Synapse based on Tungsten Disulfide (WS<sub>2</sub>) for Pattern Recognition

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We introduce van der Waals (vdW) synaptic device, which fabricated on a vdW heterostructure (h-BN/WS<sub>2</sub>). The operation of the vdW synaptic device is based on the trapping / de-trapping of electrons in the charge trapping layer on h-BN formed by O<sub>2</sub> plasma treatment, which modulates the WS<sub>2</sub> channel conductivity (weight of the synapses). Following the demonstration of synaptic characteristics in the vdW synaptic device, we prove the feasibility of such a synaptic device toward the hardware artificial neural network through training and inference simulation, where MNIST patterns are used.

**Keywords :** 2d synaptic device, vdW heterostructure, artificial neural network, pattern simulation

TM-P007

## Two dimensional WS<sub>2</sub>/Black phosphorus nanocomposite catalyst for water treatment

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This composite catalyst is designed to have a lower dimension than two dimensions and to be combined with each other, so that the band structure can be designed to suit the application and complement each other's disadvantages. [1] Through these composites, we studied nanocatalysts that satisfy bandgap changes and disadvantages of each other. This material was measured by TEM, SEM, XRD, XPS, UV-VIS spectrophotometer, FT-IR and RAMAN spectroscopy. Such catalyst materials are used in various fields such as hydrogen generation, atmospheric purification, and water purification.

**Keywords :** Two dimensional material, nanocomposite, Transition metal chalcogenide, black phosphorus, photocatalyst