

# A new device with memorizing and forgetting functions like human brain is reported

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A joint research group of International Center for Materials Nanoarchitectonics, NIMS, and Department of Chemistry and Biochemistry, University of California, Los Angeles succeeded in developing a new inorganic device named "synapse device".

National Institute of Materials Science (NIMS) and Japan Science and Technology Agency (JST) announced that a joint research group of International Center for Materials Nanoarchitectonics, NIMS, and Department of Chemistry and Biochemistry, University of California, Los Angeles succeeded in developing a new inorganic device named "synapse device", which automatically realizes two types of functions analogous to those of the [human brain](#), i.e., memorizing and forgetting. Details are published online in [Nature Materials](#).

The device is made with the atomic switch which consists of an Ag<sub>2</sub>S-coated metal Ag [electrode](#) and a counter electrode of platinum Pt, having a nanometer gap between the two electrodes. The atomic switch works by the formation and annihilation of an Ag-atom bridge between the electrodes, which is realized by controlling the solid-state [electrochemical reaction](#) of a mixed ionic and electronic conductor Ag<sub>2</sub>S.

The research group discovered that the device emulates two types of synaptic function, short-term plasticity and long-term potentiation by varying input pulse repetition time which controls the formation of the Ag-atom bridges.

The published paper in *Nature Materials* remarks that the Ag<sub>2</sub>S device indicates a breakthrough in mimicking synaptic behavior essential for further creation of artificial neural systems that emulate human memories.

**More information:** Takeo Ohno, Tsuyoshi Hasegawa, Tohru Tsuruoka, Kazuya Terabe, James K. Gimzewski & Masakazu Aono, "Short-term plasticity and long-term potentiation mimicked in single inorganic synapses", *Nature Materials* (2011) Published online: 26 June 2011 [doi:10.1038/nmat3054](https://doi.org/10.1038/nmat3054)

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