Synaptic plasticity and learning in ferroelectric tunnel junction

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Abstract (Calibri 11)

In neuromorphic computing, synapse plays the key of role by varying its connection weight between two neurons, which is known as synaptic plasticity. Among many different candidates for synaptic devices, two-terminal ferroelectric tunnel junction (FTJ) has demonstrated that gradual switching between on-state and off-state induced by DC voltage pulses strongly depend on their amplitude, duration or number, which simultaneously control ferroelectric domain configurations. However, its limited barrier height modulation inevitably gives rise to low on/off ratio. Here, we report a synaptic metal/ferroelectric /metal device which shows a giant on/off ratio (~10^7). The device also shows synaptic plasticity, learning and memory function by the modulation of tunneling barrier width. Its excellent performances may result from combination of ferroelectric polarization and migrated ions.

Figures

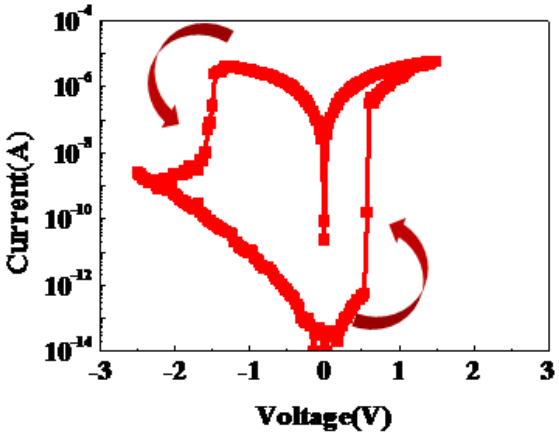

Figure 1: Resistive switching behavior.