Novel ferroelectric resistive switching memory

A solution to the issues of data retention and endurance for ReRAM

We have developed a ferroelectric resistive switching device consisting of a Pt/$Bi_{1-\delta}FeO_3$/$SrRuO_3$ layered structure. The device showed rectifying and hysteretic current–voltage (*I–V*) characteristics, i.e., resistive switching phenomena. In the *I–V* characteristics measured at the voltage-sweep frequency of 1 kHz, positive and negative current peaks originating from ferroelectric displacement current were observed under forward and reverse bias prior to set and reset switching processes, respectively, suggesting that polarization reversal is involved in the resistive switching effect. Moreover, the device showed promising characteristics for use as nonvolatile memories, including stable resistive switching without the need for any forming process, data retention of $>10^5$ s at room temperature, and endurance of $>10^5$ cycles. These results demonstrate promising prospects for application of the Pt/$Bi_{1-\delta}FeO_3$/$SrRuO_3$ ferroelectric resistive switching device to nonvolatile memory.

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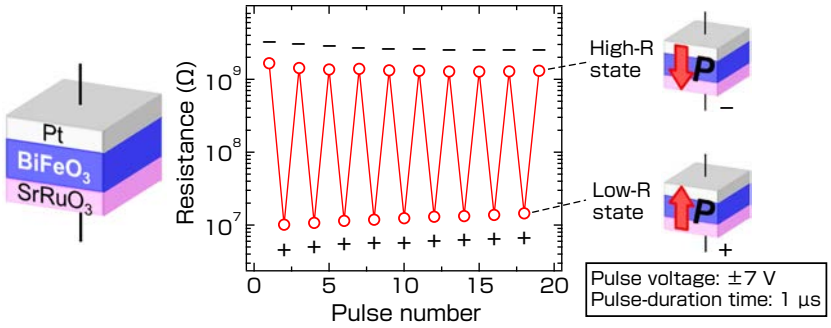

Schematic of a ferroelectric resistive switching memory cell (left) and a typical resistive switching behavior measured in pulse-voltage mode (right)
Arrows denote the directions of polarization in $BiFeO_3$.

Fabrication of a UHF-RFID antenna on a flexible substrate by printing

Inexpensive RFID tags can be supplied in large quantities.

We have developed aluminum and copper printed UHF-RFID antennas by the pressure annealing technique, which showed excellent communication properties in the UHF band. The copper and aluminum pastes are specially designed for the pressure annealing technique. A thermosetting resin was used as the organic component of the pastes to improve the adhesion between the metal particles and the substrate. As a result, the adhesion to the substrate was stronger with the developed paste than with the conventional one. By setting the hardening temperature of the thermosetting resin below 150 ℃, an antenna can be formed on a thermoplastic film such as a PET film, which has been difficult with conventional pastes. By applying the pressure annealing technique in the air to the metal pattern printed using the developed metal pastes, the surface of the pattern has become electroconductive. This technique can be easily incorporated into the conventional printing process and is expected to contribute to the widespread use of printed electronic devices.

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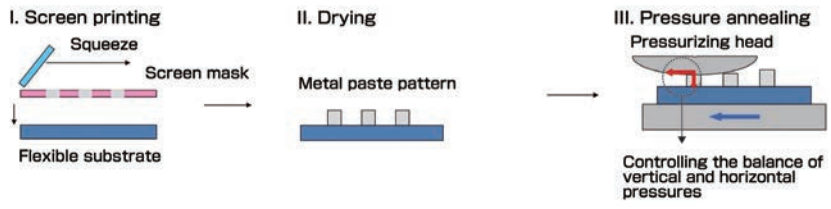

Fabrication process of printed UHF-RFID antennas