

Reversible Bipolar Resistive Switching $\text{La}_{1-x}\text{Sr}_x\text{MnO}_{3-\delta}$ thin films by C-SFM

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Colossal magnetoresistance (CMR) materials have been suggested to be excellent candidates for advanced non-volatile memory devices based on its ability to switch its resistance into two different states. The origin of this phenomenon is still controversial and further investigation of the relationship of the nanostructure and electrical properties at the nanoscale is worthwhile.

We report here SFM results, including local current sensing (C-SFM) measurements on $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ (LSMO) thin films grown by a chemical solution deposition (CSD) process on a SrTiO_3 substrate. These films have been developed through a new process leading to epitaxial La_2O_3 nanodots at the surface.

The SFM topographic images allow identifying the interfacial nanodot shape and distribution and the C-SFM permit to observe the insulating character of the nanodots, while the LSMO films display an homogeneous metallic character.

The LSMO film surface can be switched between a conductive ON state and a non-conductive OFF state by the application of an appropriate bias voltage. These results suggest that the LSMO thin films can be suitable especially for a mobile storage application, because of advantages such as a low-cost, ultrahigh density storage, and a low power consumption.

The figure illustrates the reversible switching process by a *writing and erasing* procedure performed at 5% relative humidity (RH). (a) Topographic images of two different areas of the sample surface which, as commented above, consists of a continuous metallic LSMO layer with insulating La_2O_3 islands on its top. (b) *Left column: reading process*. Current images taken at a low negative tip voltage over a large to observe the changes induced in a smaller region, (contained and centered in the shown images) after sweeping at three increasing positive tip voltages. *Right column: erasing process*. Current images taken at successively larger negative voltages (from top to bottom) until the metallic character of the previously modified region is recovered.

References:

[1] Szot et al. *phys. stat. sol. (RRL)* **1**, No. 2, R86–R88 (2007)

