

**RESISTANCE SWITCHING EFFECTS IN PEROVSKITE OXIDES**

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Resistive random access memory (RAM), which uses a reversible resistance switching effect in transition-metal oxides by the application of a strong electric field, is now believed to be one of the most promising candidates for nonvolatile data storage devices with improved performance characteristics. Comparing with magnetic tunneling junctions, employing a magnetic field for magnetization switching of the tunneling resistance, resistive RAM allows fully electronic programming and thus can avoid many problems of programming power and disturbs that are expected for magnetic RAMs. Despite the increasing technological interest, many fundamental properties of the resistance switching phenomenon, including its driving mechanism, especially, in complex transition-metal oxides like perovskites, remain poorly understood.

In this contribution I present an overview of our recent studies of the charge transport across an interface in heterostructures formed by a metal counter-electrode with bulk  $\text{La}_{1-x}\text{A}_x\text{MnO}_3$  samples (A is a divalent metal atom) and epitaxial cuprate  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$  films. A simple model, which relates resistance switchings to electric current-induced oxygen ion migration that piles up oxygen vacancies in the nano-scale vicinity of the metal/oxide interface, is discussed and the model predictions are compared with experimental data. Within the experiments three new ways of monitoring the resistance switching effect have been realized: first, we apply a special time current profile control in order to reveal the presence of diffusion processes in the heterostructures studied, second, in the cuprate samples we use a planarization technique with the aim to employ an effect of a strong diffusion anisotropy in YBCO and, third, in the superconducting cuprate we measure differential conductance  $dI(V)/dV$  in order to detect a fine gap-induced structure and to study the nature of a transition region between the two conducting electrodes. From our measurements we have found that the analytical behavior of the differential conductance  $dI(V)/dV$  versus voltage bias  $V$  for the compounds studied dramatically changes upon the application of a switching electric field. A theoretical analysis taking into account indirect inelastic tunneling through a chain of localized states is discussed. Our results do indicate that electrochemical migration of oxygen vacancies within a few nanometers of the interface between the perovskite oxide surface and a metal electrode plays a decisive role in the change of the contact resistance after high-voltage treatments.

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