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Low temperature conductance spectra of STO at the nanoscale ALIREZA MOTTAGHIZADEH, QIAN YU, ALEXANDRE ZIMMERS, HERVE AUBIN, Laboratoire de Physique et d'Etudes des Materiaux (LPEM), UMR 8213, ESPCI ParisTech-CNRS- UPMC, 10 Rue Vauquelin, 75005 Paris, France — The electronic properties of transition metal oxide materials depend on the electronic carrier density, which can be tuned with the oxygen stoichiometry. In binary MOx or ternary perovskite ABOx, it has been shown that upon applying a strong electric field, oxygen vacancies can be created or displaced in the material. This effect is responsible for the memristive behavior recently discovered in TiO2 materials by HP laboratory and launched a worldwide renew interest into ionics. We present a study of oxygen ions vacancies displacement in SrTiO3, the archetype perovskite oxide. For this work, metallic electrodes, separated by distances about 100 - 300nm, are deposited on the surface of a STO crystal and ions migration procedures and current-voltage characteristics measurements are done at low temperature, $T \sim 260$ mK. Upon applying large voltage up to 30 V, oxygen vacancies migration is identified as the apparition of resistance switching events in current-voltage characteristics. Detailed measurements of the junction show that the switching event led to the formation of a nanosized region of highly doped STO, located within the electrodes where the current-voltage characteristics show the presence of the doped in-gap states. This work was supported by the French ANR grants 10-BLAN-0409-01 and 09-BLAN-0388-01.

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