

# Redox reactions induced by metals at the (100) and (111) surfaces of SrTiO<sub>3</sub> probed by secondary ion mass spectroscopy

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The deposition of a thin layer of aluminium has recently been shown to generate a 2D electron system at the surface of SrTiO<sub>3</sub> thus being a simple and cost-efficient alternative to LaAlO<sub>3</sub> deposition [1]. In the first atomic planes of the oxide, the oxygen is pumped by the Al film that oxidizes into insulating AlO<sub>x</sub>. The properties of a 2D electron system obtained by this mean has been extensively documented evidencing that oxygen vacancies are actually present at the surface of the oxide [2,3].

We present here a direct investigation of the oxygen vacancy distribution below the surface of SrTiO<sub>3</sub> substrates coated with a layer of Al or Au. High mass-resolution secondary ion mass spectroscopy has been proven to be an relevant tool to probe oxygen stoichiometry in oxides [4]. Here, the oxygen concentration profiles were compared depending on the coating metal. Experiments were carried out on (100) and (111) oriented SrTiO<sub>3</sub> surfaces. Oxygen vacancies are observed in Al-coated SrTiO<sub>3</sub> for both orientations but not in the Au-coated samples. An estimation of the oxygen vacancy concentration and their spatial extension below the surface is proposed.

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[3] S. McKeown Walker *et al.*, Phys. Rev. Lett. 113, 177601 (2014).

[4] J. Scola *et al.* J. Phys. D: Appl. Phys., 50, 045302J (2017).