

Structural and electronic reconstructions of the LAO/STO interface

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Interface phenomena in oxide heterostructures are a subject of great interest due to the observations of new interface electronic and magnetic states. The two-dimensional conductivity discovered in $\text{LaAlO}_3/\text{SrTiO}_3$ heterostructures stands as a model and has boosted the great expectations placed in oxide electronics [1].

We have investigated the electronic and structural properties of $\text{LaAlO}_3/\text{SrTiO}_3$ interfaces (LAO/STO) by synchrotron based x-ray absorption spectroscopy [2] and grazing incidence x-ray diffraction. Local electronic properties were also studied by scanning tunneling microscopy/spectroscopy [3].

The data show that the interface electronic properties are in partial agreement with the “polarization catastrophe” picture, which attributes to the polar instability of the LAO overlayer the main driving force for an electronic reconstruction of the system. However, a thoughtful analysis of the results demonstrates that the available theoretical models do not provide a complete understanding of this phenomenon.

The possible scenario emerging from the newest available data will be critical discussed.

[1] J. Mannhart, and D. G. Schlom, *Science* 2010, 327, 1607.

[2] M. Salluzzo, et al., *Phys. Rev. Lett.* 102, 166804 (2009).

[3] Z. Ristic, et al., *EPL* 93, 17004 (2011).