



Contribution ID : 134

Type : not specified

## Oxygen vacancies in strained SrTiO<sub>3</sub> thin films: formation enthalpy and manipulation

*Tuesday, 18 July 2017 17:30 (20)*

The control and tune of the cationic and anionic defects formation is a novel route to discover new functional properties in transition metal oxides in general, and particularly in SrTiO<sub>3</sub> [1]. STO is a diamagnetic quantum paraelectric insulator, in which oxygen vacancies are typical anionic defects. Due to the donor character of the VO and the very large electron mobilities of these defects, even the slightest concentration of vacancies produces a measurable electrical conductivity. Thus, the presence of VO plays a very important role in the transport properties of STO both in the form of thin films and interfaces, such as the well-studied STO/LaAlO<sub>3</sub> interface [2]. Additionally, these heterostructures are subjected to epitaxial strain, which has been shown to have a remarkable effect on the oxygen vacancy formation enthalpy. For this reason, it is necessary to perform a systematic study of the VO formation energy in STO as a function of strain and understand the influence of these anionic defects on the transport properties of STO. Moreover, the cationic defects, namely strontium vacancies (VSr), also could play a crucial role in the structural properties of the STO thin films [3], producing a characteristic rotation pattern of the TiO<sub>6</sub> octahedra to accommodate the coherent epitaxial strain.

In this work, we present a complete thermodynamic study of VO formation in e-doped thin films grown by PVD. Additionally, we show the possibility to manipulate the oxygen vacancies by applying an external electric field.

### References

- [1] S. V. Kalinin, N. A. Spaldin, *Science* 341 (2013) 858.
- [2] A. Ohtomo, H.Y. Hwang, *Nature* 427 (2004) 123.
- [3] A. Sarantopoulos, E. Ferreiro-Vila, V. Pardo, C. Magén, M. H. Aguirre, F. Rivadulla, *Physical Review Letters* 115 (2015) 166801.
- [4] S. -Y. Choi, S. -D. Kim, M. Choi, H. -S. Lee, J. Ryu, N. Shibata, T. Mizoguchi, E. Tochigi, T. Yamamoto, S. -J. Kang, Y. Ikuhara, *Nano Letters* 15 (2015) 4129.
- [5] L. Iglesias, A. Sarantopoulos, C. Magén, F. Rivadulla, *Physical Review B* 95 (2017) 165138.

**Primary author(s) :** Ms. IGLESIAS, Lucía (PhD Student)

**Co-author(s) :** Mr. SARANTOPOULOS, Alexandros (University of Santiago de Compostela); Prof. RIVADULLA, Francisco (University of Santiago de Compostela)

**Presenter(s) :** Ms. IGLESIAS, Lucía (PhD Student)

**Session Classification :** Quantum Materials and Technologies (GEFES) I

**Track Classification :** Quantum Materials and Technologies (GEFES)