FINAL MASTER PROJECT PROPOSAL

Title

Atomic resolution STEM analysis of resistive switching induced by local electric fields in $SrFeO_x$ films.

Supervisor(s)

Dr. César Magén Domínguez.
Dr. Rodrigo Fernandez Pacheco.

Summary of the project

Novel strategies for development of multibit random-access-memories with high operational speed, ultralow power and scalability is the use of transition-metal-oxide thin films showing resistive switching (RS). RS is the reversible change of a material between a high resistance state and a low resistance state. RS is being currently explored in $SrFeO_x$, a perovskite-structure complex oxide extensively studied for applications in fuel cells, oxygen sensors, membranes and catalysis. RS in $SrFeO_x$ is driven by the transformation from perovskite to brownmillerite structure by electric-field-driven oxygen migration.

The aim of this project is analyzing the transformations of $SrFeO_x$ films upon the local application of electric fields with an AFM. The activities to be developed in this FMT will be:

- **Bibliographic research on the fundamental properties of $SrFeO_x$ thin films, resistive switching and TEM.**
- **Training on TEM sample preparation and TEM operation.**
- **Experimental study of resistively-switched $SrFeO_x$ thin films by AFM using the aberration-corrected FEI Titan of the LMA-INA for atomic-resolution STEM imaging and EELS spectroscopy.**
- **Quantitative analysis of the atomic structures of $SrFeO_x$ thin films using algorithms for atomic column position determination, and the fine structure oxygen and iron EELS edges to study the valence and coordination of Fe cations of the oxide phases.**