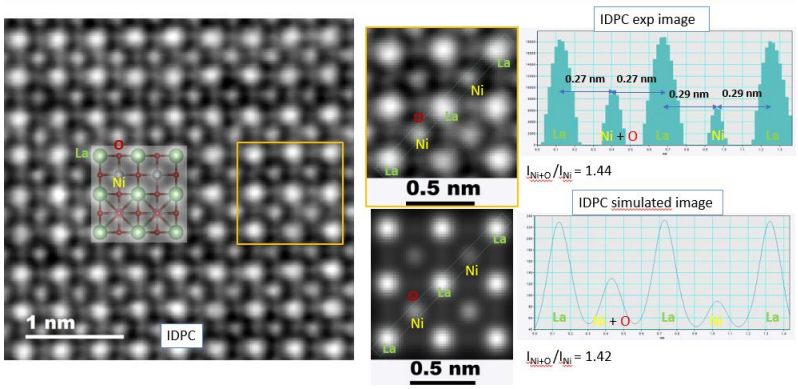
Atomic scale characterization of complex oxides thin films by transmission electron microscopy

Host: LAME, LAboratorio di Microscopia Elettronica, Area Science Park, Trieste



Complex oxides thin films are fascinating systems which host a vast array of unique phenomena, such as high temperature (and unconventional) superconductivity, 'colossal' magnetoresistance, all forms of magnetism and ferroelectricity, as well as (quantum) phase transitions and couplings between these states. Oxygen vacancies and defects play a crucial role in tuning the physical properties of these systems and controlling and manipulating them provides a degree of freedom for harvesting and tailoring their functionalities.

The correlation between the functional and atomic scale properties requires a detailed analysis by local probe techniques with advanced capabilities, allowing the accurate determination of the atomic positions, the chemical composition and the electronic state with atomic resolution. In this project, Transmission Electron Microscopy (TEM) and related spectroscopies will be used to explore the atomic structure and electronic properties of complex oxides thin films to identify the strain-related mechanisms at play and their correlation with the functional electronic properties to identify scalable routes to engineer their functionalities. The experimental activity will rely on the expertise of the TEM hosting research group and will be carried otu in strong cooperation with the growth and synchrotron groups located within the Area Science Park. Access to external advanced electron microscopy facilities will be also encouraged and supported.

The ideal PhD candidate shall have a Master Degree in Physics, Chemistry or Materials Science, previous experience with electron microscopy techniques, high drive to work independently in an international research environment with collaboration spirit, and good English skills. Skills in scripting and analysis using programming languages will be an added value.

References

https://en.areasciencepark.it/rdplatform-2023/lame/
Nano Lett. 2020, 20, 6444−6451
Phys. Rev. Appl. 2020, 13, 044011
ACS Appl. Mater. Interfaces 2017, 9, 23099−23106
ACS Appl. Mater. Interfaces 2021, 13, 46, 55666–55675

Supervisor: Dr. Regina Ciancio regina.ciancio@areasciencepark.it