

Applications of Electron microscopy imaging and spectroscopy to the study of functional oxides and degradation of other materials

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Electron microscopy imaging and spectroscopy has become a very important part of research in physics in order to make the correlation between structure and properties of materials.

In the world of oxides, the increasing interest in superlattices and multi-layered thin films is making the atomic visualization of interfaces crucial in the understanding of their properties. I will provide a few examples where the visualization of chemical composition and bonding (by atomically resolved EELS and ELNES), oxygen network (through the use of STEM-ABF imaging) and atomic arrangement (HAADF-STEM) give crucial information for the understanding of physical phenomena such as superconductivity, increase of mobility of a two dimensional electron gas (2DEG) and magnetic properties.

In a second part, the use of low-loss EELS to correlate macroscopic optical properties to structural changes on the local scale will be addressed (cationic ordering, commensurability and bond length change effects on photoluminescence).

Finally the advances made using electron microscopy in the study of degradation mechanisms of perovskite solar cells under different atmosphere, INCONEL 715 alloys under the effect of a high dose nuclear radiation and historical photographs will be exposed.