Study of interface effects in $Y_2Zr_2O_7$ thin films and 8YSZ/$Y_2Zr_2O_7$ multilayers.

The study of thin films and heterostructures has been extensively used in recent years to investigate the relevance of grain boundaries and interfaces (film/film and film/substrate) on the ionic transport properties in oxide.

Here, we investigate defective fluorites with the chemical formula $A_2B_2O_7$, which have been already considered as possible electrolyte in SOFC because of their ionic conductivity and high chemical stability.

Specifically, electrical and structural properties of thin films of $Y_2Zr_2O_7$ grown on different substrates (Al_2O_3 and MgO) by pulsed laser deposition (PLD) have been characterized.

Films grown on different substrates and thus having different microstructures exhibit very similar electrical properties (ionic conductivity owing to oxygen vacancies migration), indicating that grain boundaries only slightly affect the electrical transport properties.

Remarkably, epitaxial thin films with different thicknesses grown on MgO (110), exhibit significant film/substrate interface effect resulting in an enhanced ionic conductivity near the interface which related to high density of misfit dislocations. When exposed to higher temperatures (e.g. 700°C), the interface undergoes a structural rearrangement, which corresponds to a reduction of the number of the misfit dislocations as well as a reduction of the concentration of the accumulated oxygen vacancies at the interface.

Moreover, the strain effects on the ionic conductivity in highly conductive 8% mol yttria stabilized zirconia (8YSZ) multilayers of 8YSZ/$Y_2Zr_2O_7$ have been considered. For this purpose, a set of samples with different number of interfaces has been prepared via PLD and characterized via XRD and EIS. Our study points out a minor role of the strain on the ionic conductivity in this system of multilayers.