

## Defects in layered-structure mixed ionic-electronic $\text{GdBaCo}_2\text{O}_{5.5}$ and $\text{La}_2\text{NiO}_4$ epitaxial films and their role in charge transport.

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**Mixed ionic-electronic conductors (MIECs)** are of great interest as potential cathode materials for intermediate temperature solid oxide fuel cells (IT-SOFCs) and oxygen gas separation membranes, because of their high electronic and oxide ionic conductivities, as well as fast surface oxygen exchange kinetics. Recent studies on the  **$\text{GdBaCo}_2\text{O}_{5+\delta}$  (GBCO)** double-perovskite and the  **$\text{La}_2\text{NiO}_{4+\delta}$  (LNO)** have shown interesting mixed ionic and electronic transport properties [1-2]. Due to their layered structure they present high anisotropy in their charge transport, therefore thin epitaxial films offer an ideal geometry to access to the intrinsic transport properties of these materials. Thin epitaxial films were grown by **Pulsed Laser Deposition (PLD)**.

The remarkable oxygen surface exchange rate  $k$  and oxide ionic diffusion  $D$  found in these materials are thought to be related with the large mobility of oxide ions along interstitial sites in a particular crystallographic direction in the structure. However, a slight deviation from the cationic stoichiometry tends to form defects in the structure, which are particularly apparent in epitaxial films, when slightly varying the deposition conditions. Co-deficiency in GBCO induces the formation of supplementary GdO planes as proven by transmission electron microscopy [3], whereas in  $\text{La}_2\text{NiO}_4$ , even for an average stoichiometric composition, the films tend to segregate forming  $\text{La}_2\text{O}_3$ , possibly leaving a La-deficient matrix which might induce the formation of planar defects. The presence of this type of defects substantially affects the electronic transport properties as observed in planar conductivity measurements, by either reducing or increasing the film overall conductance, in GBCO and LNO films respectively. This is a direct consequence of the change in the transition metal valence and would have an implication in the oxide ionic transport as well.

### Acknowledgements

We thank the Spanish science & tech ministry: (MAT2008-04931, CONSOLIDER-CSD2008-023), JAE-PreDoc.

### References

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