Synthesis, characterization of high-temperatures properties and evaluation of $REBa_2Cu_3O_{6+\delta}$ (RE= La, Nd and Y) as cathode for Intermediate Temperature Solid Oxide Fuel Cells

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Intermediate Temperature Solid Oxide Fuel Cells (IT – SOFCs) have proven to be a promising alternative in terms of efficient energy conversion in an environmentally friendly way, in which electrical work, water and heat are obtained as a result of a series of electrochemical processes trough heterogeneous catalysis mechanism [1]

The bibliography suggests [2] that the high performance of these devices is related to the chemical composition, microstructure of ceramics and the crystalline structure of materials used as a cathode or anode. Nano or microstructure, porosity, high concentration of oxygen vacancies and low migration energies thereof are some of the basic requirements that materials with potential use in these devices must fulfill.

Taking into account the structure of the YBCO 123 high critical temperature superconductor, the presence of mobile oxygen vacancies and the possibility to synthetize this kind of ceramics in our lab using a simple and straightforward technique, it is proposed to study this type of laminar perovskites (REBCO series, with RE = Y, Nd and La) as IT-SOFC electrode.

The Rietveld analysis (Figure 1) performed on the data obtained by powder XRD (using Synchrotron Light radiation [3]) allowed to calculate the crystallographic TECs and compare them with conventional electrolytes, thus making an evaluation of mechanical stability. The chemical stability and reactivity of the electrolyte electrode system was evaluated by powder x-ray diffraction.

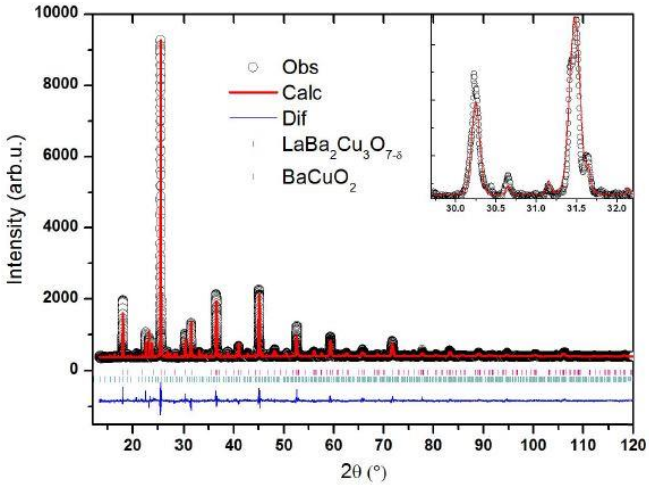

Figure 1. Rietveld fit of LaBCO at 400 °C in air showing the presence of $BaCuO_2$ as a secondary phase.

The results obtained show that one of the members of the series, Y, present an O - T phase transition (Pmmm-P4/mmm) which could compromise the mechanical stability of the cell. While for La and Nd this transformation does not occur and they have moderate polarization resistances.

[1] A. Da Rosa, *Renewable Energy Preocesses*, Elsevier, 2013, ISBN: 978-0-12-397219-4.

[2] S.B. Adler, Chemical Reviews, 10 (2004) 4791-4844.

[3] See http://www.lnls.cnpem.br/linhas-de-luz/xpd-en/overview/ for details.

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