

Evaluation of $\text{Ln}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ (Ln= La, Sm) perovskites as cathode materials for SOFC.

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Keywords: Synthesis, Microstructure, Cathode, Perovskites, SOFC

Solid Oxide Fuel Cells (SOFCs) are interesting energy conversion systems because of their high energy efficiencies and environmental advantages. One of the problems for their commercial applications is still the high cost of the materials used. The improvement of the Intermediate Temperature-Solid Oxide Fuel Cells (IT-SOFCs) can be the solution for which second generation development of electrolyte and electrode materials for this systems is needed [1,2]. Synthetic conditions of the compounds are in many cases responsible of structural differences and so of material properties like their electrochemical behaviour [3].

The aim of this work has been to study the compositional effect of $\text{Ln}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ (Ln = La, Sm) perovskites and the influence of the synthetic method (ceramic and glycine-nitrate routes) on the morphological, structural, and electrochemical properties. $\text{La}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ and $\text{Sm}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ compounds have been chosen due to their high ionic radius ($\langle r_A \rangle = 1.34 \text{ \AA}$) for the first one and high size disorder ($\sigma^2(r_A) = 0.0286 \text{ \AA}^2$) for the second one. These materials are interesting to use as cathodes in IT-SOFCs [4-6].

The compounds have been studied by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES), X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), and Electrochemical Impedance Spectroscopy (EIS).

$\text{La}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ samples obtained by different synthetic methods reveal that their morphology is clearly different (Fig. 1), in good agreement with Melo Jorge et al. [7]. The compound prepared by ceramic method show bigger heterogeneous grain sizes ($\sim 0.5\text{-}4 \mu\text{m}$) because of the higher calcination temperature and the longer reaction time of the synthetic process. On the other hand, $\text{Ln}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ (Ln = La, Sm) perovskites synthesised by glycine-nitrate route present similar morphology [8], porous structure and agglomerated grains with average particle sizes of $0.2 \mu\text{m}$ (Fig. 2).

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9. This work has been financially supported by the Departamento de Industria del Gobierno Vasco/Eusko Jaurlaritza, within the strategic actions in Microenergy (ETORTEK 2007-2009 (GENEDIS 3), SAIOTEK 2009 programmes). SGiker

technical support (UPV/EHU, MEC, GV/EJ, European Social Fund) is gratefully acknowledged. A. Ecija wishes to thank UPV/EHU for funding.

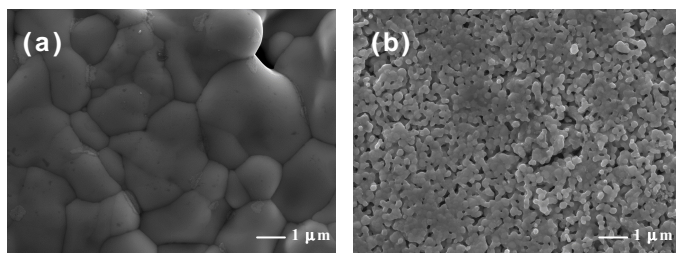


Figure 1. SEM micrographs of $\text{La}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ compounds prepared by (a) the ceramic route and (b) the glycine-nitrate route.

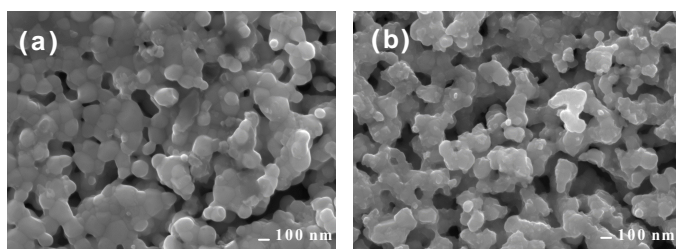


Figure 2. SEM micrographs of $\text{Ln}_{0.5}\text{Ba}_{0.5}\text{FeO}_3$ (a) Ln= La and (b) Ln= Sm prepared by glycine-nitrate process.