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STUDY OF THE CRYSTALLINE STRUCTURE AND OXIDATION STATES OF THE CO AND PR OF THE SERIE $La_{0.5-x}Pr_xBa_{0.5}CoO_{3-}$ WITH SYNCROTRON RADIATION

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Solid oxide fuel cells (SOFCs) are promising devices to generate clean energy efficiently. Numerous studies are currently underway to reduce the operating temperature of these cells from 800 - 1000℃ to temperatures below 700℃ (IT-SOFC). Perovskite type materials (ABO3) have generated great interest due to their excellent electronic conduction properties and good conduction by oxygen anions at high temperature. This mixed conduction makes them great candidates to be applied as an electrode in IT-SOFCs.
In this work, the crystalline structure and the chemical properties of Co and Pr in the series $La_{0.5-x}Pr_xBa_{0.5}CoO_{3-}$ ($0 \leq x \leq 0.5$) were studied by X-ray diffraction (XRD) and X-ray Absorption Spectroscopy (XAS) technique, in controlled conditions of atmosphere and temperature. The XRD and XAS data analyzes indicate that these samples present a mixture of cubic and tetragonal phases and at room temperature the cobalt is present in oxidation states +3 and +4 while at higher temperatures it is reduced, mostly presenting an oxidation state +2 and to a lesser extent +3 and +4. It could also be concluded that the oxidation state of Co is very sensitive to temperature and partial pressure of oxygen (pO_2). On the other hand, we observe that Pr remains almost invariant due to changes in temperature and pO_2 in the samples analyzed. All this suggests that the ease of the Co to change its oxidation state plays a major role in the electrocatalytic activity of the cathode.

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