Structural analysis of Co-doped lanthanum chromite by anomalous X-ray scattering

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Lanthanum chromite ($LaCrO_3$) is the most adequate material for use as interconnector in solid oxide fuel cell (SOFC) applications, due to its intrinsic properties, namely, its good electrical conductivity and resistance to environment conditions in fuel cell operations. $LaCrO_3$ presents a perovskite-type structure. At a temperature of approximately 260°C it undergoes a crystallographic transformation, from orthorhombic (Pnma) to rhombohedral (R-3c) structure. In the present contribution we report the results of the refinaments of the crystalline structures of cobalt-doped lanthanum chromite ($LaCr_{1-x}Co_xO_3$, $x = 0.10$; 0.15; 0.20; 0.25; 0.30), performed by means of the Rietveld method. The powders of cobalt-doped lanthanum chromite were obtained by combustion synthesis, using urea as fuel. The X-ray diffraction patterns were obtained using synchrotron radiation of energy equal to 5.85 keV, near the chromium K edge and at room temperature. For the Co-doped samples, except for $x = 0.25$ and 0.30, one observed a structure similar to the non doped $LaCrO_3$, namely, Pnma symmetry, with variations in the lattice parameters (a, b, c) and diminishing unit cell volumes. The samples with $x = 0.25$ and 0.30 presented both orthorhombic and rhombohedral structures, showing that cobalt additions over 25% produces the stabilization of rhombohedral lanthanum chromite at room temperature.

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