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Structure, electrical conducting and thermal expansion properties of $Ln_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ (Ln = La, Pr, Nd, Sm) perovskite-type complex oxides

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Abstract

Fine and uniform $Ln_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ (Ln = La, Pr, Nd, Sm) powders with a perovskite phase were produced using a glycine–nitrate process. The structure, electrical conducting and thermal expansion properties of the resulting ceramics were investigated. The results indicate that replacing La^{3+} by smaller lanthanide cations led to a change in crystal structure from rhombohedral to orthorhombic symmetry and a decrease of the pseudo-cubic lattice constant. It was found that the electrical conducting properties decrease with reducing lanthanide cation size. Compared with $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$, the degradation of the electrical conducting properties in $Pr_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ and $Nd_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ is not

pronounced, whereas the electrical conducting properties of $Sm_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ decline to an unsatisfactory level. There is an evident increase in thermal expansion at high temperatures for all the compositions. This is attributed to a chemically induced lattice expansion due to oxygen lose and formation of oxygen vacancies. $Pr_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ and $Nd_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ present relatively low thermal expansion coefficient values of 14.2×10^{-6} and 13.2×10^{-6} K^{-1} averaged between 100–750 and 100–700 °C, respectively.

Keywords: Ceramics; Crystal structure; Electrical transport; Thermal expansion

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