Phase Composition and Transport Properties of oxide ion conductors based on $Sr_{1-x}K_xGeO_{3-x/2}$

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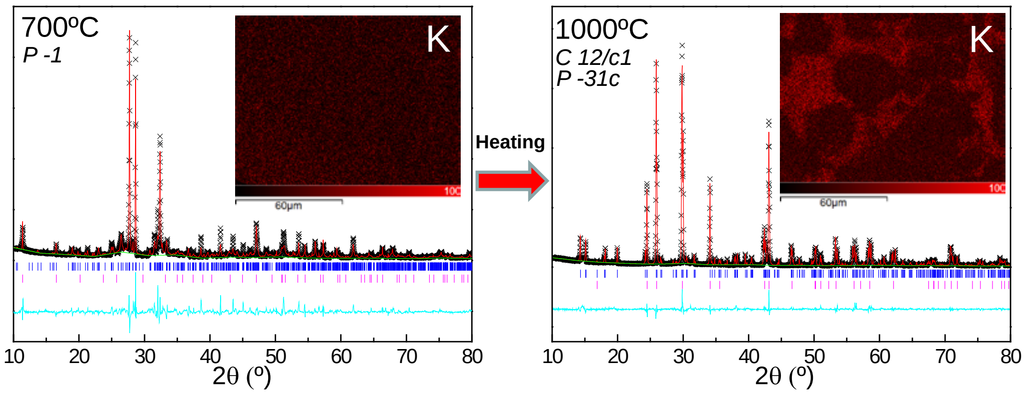
Oxide ion conductors have been increasingly studied because of their potential applications in different electrochemical devices, such as, oxygen sensors, membranes for oxygen separation and components of fuel cells. Solid Oxide Fuel Cells (SOFCs) are electrochemical devices that operate at high temperatures, 600-1000 ºC, with higher efficiency for electrical generation than conventional systems based on fuel combustion. The high operating temperatures of the SOFC is mainly due to the limited ionic conductivity of the electrolyte. $Zr_{0.84}Y_{0.16}O_{1.92}$ (YSZ) is the electrolyte most widely used in commercial systems due to its high stability and oxide ion conductivity at elevated temperatures (900-1000 ºC).

However, there is a great interest in the development of devices with lower operation temperatures (600-800 ºC) to overcome collateral problems like difficulties in cell sealing or shorter lifetime of the components caused by the high operation temperature of YSZ.

The high oxide ion conductivities recently reported in Na- and K-doped strontium silicates and germanates, make them potentially suitable for SOFC electrolytes. In this work, the structure, microstructure and electrical properties of $Sr_{1-x}K_xGeO_{3-x/2}$ (x = 0.0, 0.1, 0.15 and 0.2) compounds have been re-investigated. The materials have been prepared by conventional ceramic and freeze-drying precursor methods. Different phases are stabilized depending on the synthetic method and the sintering temperature. Samples prepared by freeze-drying at 700 ºC exhibit a triclinic structure, which transforms to a mixture of monoclinic and trigonal related phases on heating at 1000 ºC. The presence of some broad diffractions peaks, which are not fitted in the Rietveld analysis, indicates the existence of an amorphous or low-crystalline phase (ACn) that have been quantified by an external standard procedure (G-factor approach). The homogeneity and chemical composition of the samples were checked by scanning electron microscopy combined with energy dispersive spectroscopy (EDX). The total conductivity of these materials was studied by impedance spectroscopy.



Keywords SOFC, $SrGeO_3$, electrolyte, conductivity.

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