# Synthesis of $La_{9,33}Si_6O_{26}$ oxyapatite powders by new modified sol-gel route: application as electrolyte for SOFC


## ABSTRACT

The oxide ion conductor is an important functional ceramic, which can be used as the electrolyte of SOFC (solid oxide fuel cell). YSZ (yttria stabilized zirconia) is a typical high temperature (900-1000°C) SOFC electrolyte. Investigations of reducing the SOFC operating temperature are interesting to decrease the costs of the cell fabrication. Lanthanide silicates with apatite-structure [$Ln_{10}(XO_4)_6O_2 \pm y$ ] (X=Si or Ge) have considerable interest in recent years as electrolyte of intermediate temperature SOFCs. The ionic conductivity of lanthanum silicate is higher than YSZ conductivity, at temperatures from 600 to 800 °C; therefore it is a promising material for SOFC application. In this work modified sol-gel route was settled to synthesize lanthanum silicate, $La_{9,33}Si_6O_{26}$, oxyapatite type powders. Silica aerogel was initially obtained from $Na_2SiO_3$ solution by acid catalyzed reaction. $La(NO_3)_3.6H_2O$ solution was embedded on above silica. Lanthanum silicate powders of oxyapatite crystalline phase were achieved by thermal treatment of lanthanum embedded silica at 900 °C. The obtained products were characterized by analysis techniques such as X-ray diffraction, scanning electronic microscopy and BET method.



Keywords: $La_{9,33}Si_6O_{26}$, silicate, lanthanum, sol-gel, SOFC