Optimization of the large scale synthesis of the LSF-20 cathode material for SOFCs

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Solid oxide fuel cells (SOFCs) have the potential to be one of the cleanest and most efficient energy technologies for direct conversion of chemical fuels to electricity. Economically competitive SOFC systems appear poised for commercialization, but widespread market penetration will require continuous innovation of materials and fabrication processes to enhance system lifetime and reduce cost. Additional requirements arise for the technologies for synthesis of SOFC materials. These requirements originate from the demands for large scale SOFC industrial production. In this sense, solution combustion synthesis (SCS) is a simple and reproducible method used to obtain several types of ceramic oxides for a variety of applications. A typical SCS procedure utilizes a self-sustained exothermic reaction among well-mixed reactants to achieve the rapid and economical synthesis of particulate products. Up to 2008, SCS method has been adopted to fabricate more than 1000 kinds of oxide powders over more than 65 countries [1]. The properties of the resulting powders (crystalline structure, amorphous structure, crystallite size, purity, specific surface area and particle agglomeration) depend heavily on the adopted processing parameters [2,3].

The objective of this work is to obtain, on a large scale, the perovskite-type oxide $La_{0.8}Sr_{0.2}FeO_3$ that shows promising properties as cathode for SOFC applications. In this study, the optimization of the large scale synthesis has been realized by the glycine-nitrate combustion method (**Figure 1**). In this sense, first of all, the effect of some parameters such as temperature, glycine/nitrate ratio and times and cooling rates used in the temperature treatments, that play a key role in the final properties of the obtained materials, has been analyzed. The characterization has been realized by ICP (inductively coupled plasma atomic emission spectroscopy) XRD (X Ray diffraction), SEM (scanning electron microscopy) and dilatometry.

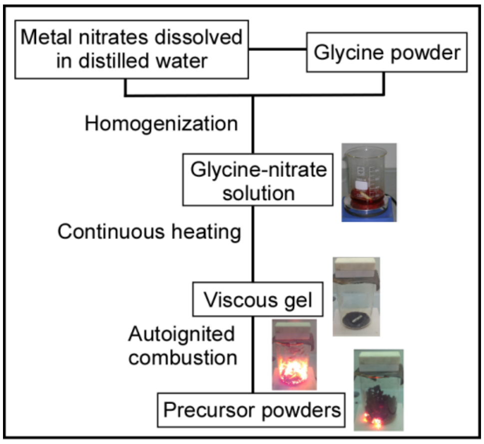

Figure 1. Scheme of glycine nitrate combustion synthesis.

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