room temperature chemical route for the synthesis of nanocrystalline doped ceria for SOFCs.

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Electrochemical performances of metal oxides strongly depend on the chemical route employed for the synthesis of the powders. Ceria based oxides represent conventional SOFC materials for intermediate temperature applications. Various techniques for synthesizing nanocrystalline ceria based oxide powders have been reported in literature, including aqueous solution based co-precipitation and sol-gel techniques [1, 2].

In this paper an effective synthesis for the preparation of samaria and gadolinia-doped ceria is presented. The peculiarity of this technique is to combine the low cost of conventional co-precipitation with the small particle size and low calcination temperature of sol-gel chemical routes involving alkoxides.

The reaction uses nitrates as metal precursors in the presence of a polyfunctional amine. Hydrolysis of coordination water performed by the amine leads to the precipitation of hydroxides. Subsequentely, amine favours deprotonation of the hydroxides and the condensation of the oxide at room temperature during ageing, as confirmed by FT-IR analysis.

Further thermal treatments, selected on the basis of TG-DTA analysis, are only necessary for the burnout of residual organic compounds, so very low calcination temperature is required.

FE-SEM observations, EDS and XRD analysis were performed to characterize the powders in terms of morphology, purity and crystallinity. Figure 1 shows diffraction patterns for samarium doped ceria (SDC) at different steps of the synthesis. Figure 2 is a FE-SEM image of the SDC powder after thermal treatment at 350°C.

Powders were pressed into pellets and sintered at selected temperatures to investigate sintering behaviour of the material.

Figure 3 shows the morphology of SDC pellet after sintering at 1400 °C for 5 hours.

The ionic conductivity of the pellets was assessed using electrochemical impedance spectroscopy in air at selected temperatures. The electrical properties were correlated with the microstructure of the pellets, modified according to the different sintering conditions.

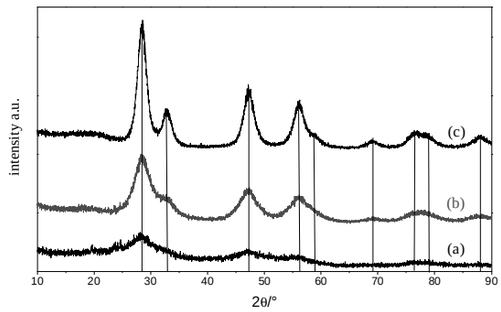

Figure 1. Diffraction patterns of initial precipitate (a), precipitate after ageing (b), and powder after thermal treatment at 350°C.

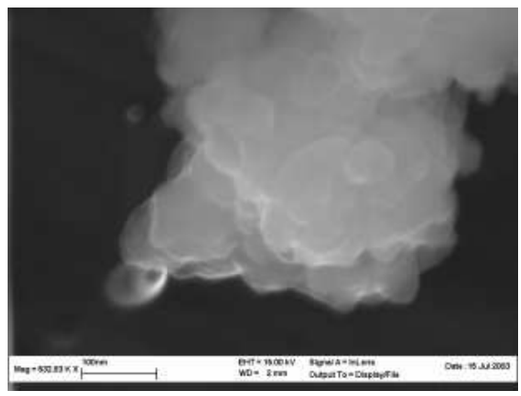

Figure 2. FE-SEM image of SDC powder after firing at 350°C.

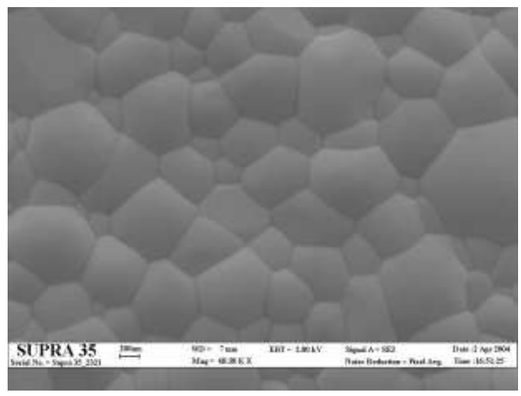

Figure3. FE-SEM image of pellet sintered at 1400 °C for 5 hours.

References:

1. J.G. Li, T.Ikegami, T.Mori, *Acta Materialia*, 52 (2004) 2221–2228
2. W. Huang, P. Shuk, M. Greenblatt, *Solid State Ionics* 53 (1998) 113