3RD BRAZIL MRS MEETING

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SYMPOSIUM E:

PROGRESS ON DEVELOPMENT OF ELECTROCERAMIC MATERIAIS (Joint Symposium: IV Brazilian Symposium on Electroceramics)

Symposium Organizers:

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Energéticas e Nucleares C.P. 11049, CEP 05422-970, Pinheiros, S. Paulo, Brazil; V. Espósito, E. Traversa. TOR VERGATA; D. Z. de Florio. UNESP.

The yttria-stabilized zirconia/nickel oxide composite (YSZ/NiO) is the precursor of the YSZ/Ni cermet, which is used as SOFC anode material. Thus, in order to fabricate high performance anodes it is necessary to careful control both the microstructural and the electrical properties of the precursor material. In the present study, YSZ/NiO composites were prepared by a modified liquid mixture technique in the concentration range of 0-75 mol% of NiO. This method was found to result in powders with dispersed nanometric NiO particles, as inferred from scanning electron microscopy analysis. Sintering at 1350 °C for 1 h resulted in samples with high relative densities. The phase analysis and electrical characterizations were performed by X-ray diffraction and impedance spectroscopy (IS) measurements, respectively. The IS experiments were performed in the 100-800 °C temperature range with controlled oxygen partial pressure. The main results show that the composite samples are comprised of a homogenous distribution of the two oxides, and no solubilization of the NiO into the YSZ structure was detected. The IS data indicate three NiO content ranges where ionic, mixed, and electronic conduction are predominant. In addition, the temperature dependence of the electrical conductivity shows two Arrhenius-type transport processes with different activation energies in samples with mixed conductivity. This process was associated with a p-type semiconductivity contribution.

E - O014 SINTERING AND ELECTRICAL PROPERTIES OF YTTRIA-STABILIZED ZIRCONIA/NICKEL OXIDE COMPOSITES

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The study of the yttria-stabilized zirconia/nickel oxide composites (YSZ/NiO) is motivated by both the crescent interest in mixed ionic and electronic conductors (MIEC) and the use of the YSZ/Ni cermet as the solid oxide fuel cell (SOFC) anode. Therefore, controlling the microstructure of the YSZ/NiO is an important issue for the study of the electrical transport mechanisms of the composite MIEC and also a key step for the fabrication of high-performance SOFC anodes. In this study the composites were prepared by a modified liquid mixture technique in the concentration range 0-75 mol% of NiO, followed by calcination at 450 °C. The powders were investigated by field emission scanning electron microscopy and X-ray diffraction analysis (XRD). Pellets sintered at 1350 °C for different times (ts) were studied by XRD and impedance spectroscopy (IS). The IS experiments were performed in the 5 Hz-13 MHz frequency range and 100-800 °C temperature range. The IS data show that there is a strong dependence of the electrical conductivity on the sintering time. The 28 mol% of NiO composite sintered for ts = 4 h exhibits an activated behavior of the electrical conductivity. For decreasing ts, two slopes in the Arrhenius plots and higher values of the electrical conductivity are observed. These results suggest that the relative grain size and possible reactions of the oxides can be controlled by sintering parameters in order to optimize the electrical properties of the YSZ/NiO composite.

E - O015 STRUCTURAL AND OPTICAL PROPERTIES OF BI1.5ZNNB1.5O7 PYROCHLORE THIN FILMS PREPARED BY CHEMICAL METHOD

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The Bi1.5ZnNb1.5O7 pyrochlore thin films were prepared by the polymeric precursor method. The films were deposited by dip coating onto FTO/glass, Si(100) and Pt/Ti/SiO2/Si(100) substrates. These films were annealed at temperatures ranging from 400 to 550 oC for FTO substrates and from 500 to 800 oC for Si(100) and Pt/Ti/SiO2/Si(100) substrates. Atomic force microscopy images revealed the surface morphology of films as function of the annealing temperature. X-ray diffraction detected the cubic pyrochlore in films treated above 450 oC. Films were fully crystallized at 700 oC. The films deposited onto Pt/Ti/SiO2/Si(100) and Si(100) showed a high 222 orientation. Optical band gap calculate from the transmission measurements is 4.0 eV.

E - O016 TEXTURED LaNiO3 FILMS DEPOSITED BY POLIMERIC PERCURSOR METHOD AND ASSISTED BY A MICROWAVE OVEN

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