



3RD BRAZIL MRS MEETING

October 10-13, 2004

S Y M P O S I U M E:

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

Symposium Organizers:

Antonio Eduardo Martinelli (DEME-UFRN)

Antonio Gouveia de Souza (DQ-UFPB)

José Antonio Eiras (DF-UFSCar)

Reginaldo Muccillo (IPEN-SP)

Sidnei Antonio Pianaro (DEMA-UEPG)

HP method is a simple and alternative method for manufacturing of 0-3 or 1-3 connectivity composites.

- E - P010 INFLUENCE OF PREPARATION METHODS ON FERROELECTRIC BEHAVIOR OF P(VDF-TrFE)/BaTiO₃ COMPOSITES.
R. Gimenes, L. O. Coelho, M. A. Zaghete, M. Cilense, M. J. Bertolini, J. A. Varela. CMDMC - IQ/UNESP. Rua Prof. Francisco Degni s/n, CEP 14800-900, Araraquara, SP, Brazil.

Electroactive composites are technologically interesting due to flexibility, high mechanical compliance, and good piezoelectric properties. The selection of adequate raw materials is not sufficient condition to assure the good piezoelectrical performance of composite. Connectivity of the individual phases is of highest important role, because this controls the electrical flux pattern in the sample. Connectivity depends on the sample preparation method. In this work the influence of P(VDF-TrFE)/BT composite preparation on the ferroelectric hysteresis is reported. The samples were prepared using two methods: (a) solvent cast method; (b) solvent extraction by water method. For the a-method the films were deposited on to a glass substrate. After crystallization at 100oC for 12 hours the samples were characterized by SEM. Ferroelectric hysteresis measurements are reported as function of ceramic volume. The SEM analysis showed that the a-method produce 0-3 composites while for the b-method was observed the 3-1 connectivity. The increase of ceramic content increases the remanant polarization for both methods; however the largest values of polarization were obtained for the samples prepared by b-method. The composite P(VDF-TrFE)/BT 45/55vol% prepared by b-method presented the best value of remanant polarization (5,8micronC/cm²).

- E - P011 CAPACITANCE ANALYSIS OF PD-DOPED SnO₂ THICK FILMS SENSORS EXPOSED TO CO ATMOSPHERES
M. A. Ponce, J. Fenoglio, M. S. Castro, C. M. Aldao, INTEMA, J. B. Justo 4302, Mar del Plata, Argentina, B7608FDQ.

It was found that resistance and capacitance of SnO₂ thick-films are modified by CO adsorption at the grain surface. In particular, the capacitance response to a CO atmosphere was studied. In the analysis, the presence of Schottky potential barriers at the grain boundaries was considered to be responsible for the observed results. An increasing of the capacitance with time can be related to the reaction of CO with the previous oxygen adsorbed at the grains surface. Also, we found that other mechanisms affect the sensor response.

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- E - P012 SYNTHESIS AND CHARACTERIZATION OF LANTHANUM BETA ALUMINA
G. C. C. Costa, R. Muccillo. CCTM – IPEN, Centro Multidisciplinar para o Desenvolvimento de

Materiais Cerâmicos - Instituto de Pesquisas Energéticas e Nucleares, C.P. 11049, CEP 05422-970, Pinheiros, S. Paulo, SP, Brazil.

LaB-Al₂O₃ solid electrolyte powders were synthesized by solid state reaction of oxides and by the polymeric precursor method. The aim of this study was to obtain the lanthanum B-alumina phase, which could be used as solid electrolytes in oxygen sensors for determination of ultra-low oxygen contents in molten steel at high temperatures (>1773 K). The ceramic powders have been characterized by scanning electron microscopy and X-ray diffraction for structural analysis, and the sintered pellets by impedance spectroscopy for electrical response analysis. The X-ray diffraction results show that the LaAl₁₁O₁₈ phase has been synthesized. The dependence of the electrical conductivity of the LaB-Al₂O₃ sintered pellets upon temperature and the use of magnesium oxide as sintering aid for obtaining dense electrolytes were studied.

E - P013 MULTIFERROIC PROPERTIES OF BIFEO₃ COMPOUNDS PRODUCED BY POLYMERIC PRECURSOR ROUTE

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The perovskite BiFeO₃ presents both a spontaneous magnetization polarization. We have produced polymeric precursor route. The powder were heat-treated in the temperature range of 350 to 800°C in air. The structure, magnetic and electric properties were investigated by X-ray diffraction, magnetization measurements. The XRD pattern revealed that the BiFeO₃ samples crystallize in a rhombohedrally distorted perovskite structure, space group R3c. The evaluated unit cell parameters are $a \approx 53,58$ and $c \approx 6,93$ Å, which are close to those described in literature. Although, small peaks at $2\theta \approx 27$ and 33° were attributed to an additional phase Bi₂₅FeO₄₀. The ferromagnetolectric properties of BiFeO₃ compounds, show the influence of magnetic and electric field on the polarization and magnetization properties, respectively.

E - P014 MICROSTRUCTURAL DEVELOPMENT OF TRIVALENT OXIDES AND ZNO-DOPED TIN TITANATE ZIRCONATE

V. L. Arantes. IP&D – UNIVAP, Avenida Shishima Hifumi, 2911, CEP 12244-000; D. M. P. F. Souza. DEMA – UFSCar; P. J. Castro, INPE.

This work consisted of the preparation of pure and trivalent oxides, besides ZnO-doped tin titanate zirconate by oxide mixture. Samples were sintered at temperatures ranging from 1200 to 1450°C. Analyses were made of the influence of sintering on the microstructural development and dielectric properties of these materials at high frequencies. The liquid phase composition present during sintering was shown to be dependent on the ZnO percentage. This percentage determines grain composition and, hence, dielectric performance at high frequencies. A maximum unloaded quality factor, Q_l, was found for 1.0%wt ZnO-doped ZTS sintered at 1400°C.

E - P015 SELECTION OF LIQUID PHASE FORMING ADDITIVES AT SINTERIZATION OF POTASSIUM STRONTIUM NIOBATE CERAMICS

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Development of K₂Sr₂Nb₅O₁₅ ceramic of type tetragonal bronze tungsten (TTB) has attracted attention because of low or free-fatigue and lead-free features. The main drawback of these ceramics is a high processing-sintering temperature between 1450 and 1550 °C. The objective of this study was to analyze several additives former of liquid phase that might result in the decreasing of the sintering temperature of K₂Sr₂Nb₅O₁₅. Then, some potential sintering additives were studied, as CuO, WO₃, V₂O₅ and H₃BO₃. Physical and chemical transformations of these oxides and the stability of K₂Sr₂Nb₅O₁₅ in the presence of additives were investigated by differential thermal analysis (DTA up to 1300 °C) and differential scanning calorimetry (DSC up to 600 °C). All materials were studied in air, with a heating rate of 10 °C.min⁻¹. CuO showed oxidation-reduction phenomenon at 1049 °C and melting point at 1153 °C. WO₃ showed similar oxidation-reduction phenomenon at 1200 °C, structural transformations in the range from 220 °C to 1104 °C and sublimation at 1275 °C. V₂O₅ showed