

# Symposium H

**POSTER SESSION PH1 - MONDAY, OCTOBER 9**

**H501 - CHARACTERISTICS OF ELECTROMAGNETIC RADIATION ABSORPTION IN PLAIN COVERINGS WITH FERRITE MG-MN**

Carlos Alberto Reis Freitas (IEAv)

Characteristics of Electromagnetic Radiation Absorption in Plain Coverings with Ferrite Mn-Mg The production technology of covering electromagnetic radiation absorbers of the blanket type is related with the development of new materials and its electromagnetic properties. In this paper it is presented a methodology of one layer plain covering production, with absorption characteristics tuned in the frequency of 9 GHz. These coverings have been confectioned joining ferrite powder of Mg-Mn with aliphatic resin with base epoxy. Reflectivity measurements have been carried out in three samples with different compositions, in the 8 to 12 GHz frequency range, to study its electromagnetic radiation absorption characteristics. The reflectivity data are presented and compared between the different samples.

**H505 - SnO2-BASED VARISTORS OBTAINED THROUGH ALTERNATIVE ROUTES OF SYNTHESIS**

Miriam S. Castro (INTEMA (CONICET-UNMdP)) and Rodrigo Parra (INTEMA (CONICET-UNMdP))

SnO2 varistors were prepared through mixing the oxides and through the Pechini method. The selected system consisted in the typical SnCoNb-composition with Fe as nonlinearity enhancer. The precursor powders were characterized with TEM and specific surface area determinations. The sintered pellets were studied with SEM, TEM, XRD, IS and current-voltage measurements. VARISTORS may be produced from different processes such as mixing the oxides of a desired composition, through the polymeric precursors method, through the oxalates route or through sol-gel techniques, among others.

**H508 - Y-CSZ / AL2O3 CERAMIC COMPOSITE OBTAINED BY THE COPRECIPITATION ROUTE: MICROSTRUCTURAL AND MECHANICAL PROPERTIES**

Valter Ussui (IPEN), Rafael Henrique Lazzari Garcia (IPEN) and Dolores Ribeiro Ricci Lazar (IPEN)

Cubic stabilized zirconia ceramics (CSZ) presents good electric properties for application as electrolyte in solid oxide fuel cells. However, its low fracture toughness and flexure strength should be improved. In this work the influence of alumina (0 – 30 wt%) on microstructural and mechanical properties of Y-CSZ matrix was evaluated.

**H509 - RESONANT FREQUENCY OF MULTILAYER PLANAR ANTENNAS WITH PHOTONIC AND SUPERCONDUCTIVE MATERIAL**

George Dennes Alves (UFRN) and Humberto César Fernandes (UFRN)

The Transverse Transmission Line method (TTL) is used in the analysis of the antenna in combination with the Moment method. The Superconductive Material (YBCO) is utilized as patch irradiate. The PBG (Photonic Band Gap) material is utilized as substrate to improve the propagation in microwave frequencies. Numerical results of the resonant frequency are shown.

**H510 - DEVELOPMENT AND CHARACTERIZATION OF ZIRCONIA-YTTRIA/ZIRCONIA-MAGNESIA COMPOSITES FOR DISPOSABLE HIGH TEMPERATURE OXYGEN SENSORS**

Reginaldo Muccillo (IPEN) and Érica Caproni (IPEN)

Composite solid electrolytes of zirconia: 8 mol% magnesia and zirconia: 3 mol% yttria were developed for using in devices for the detection of oxygen at high temperatures. The electrical behaviour was studied by the impedance spectroscopy technique and the linear shrinkage by dilatometry. Data on sensitivity, selectivity and response time of the composites to oxygen were collected at 1000 °C. The results show that the composites have similar shrinkage behaviour and improved electrical behaviour comparing to magnesia partially stabilized solid electrolytes of commercial oxygen sensors.

**H511 - ELECTRICAL CHARACTERIZATION OF CERIA AND GD/GDPR/PR DOPED CERIA FOR SOLID OXIDE FUEL CELL ELECTROLYTE**

Dulcina P. F. de Souza (UFSCar) and Guilherme Baltar Crochemore (UFSCar)

The SOFC high operating temperature is responsible for the high cost of this technology. Efforts have been done to reduce the operating temperature, changing YSZ electrolytes for materials that show higher electrical conductivity and ceria based electrolytes are a strong option. This work concerns to the electrical characterization of Gd and Gd-Pr doped-ceria. The grain conductivities of the Gd and Gd-Pr doped samples are higher than pure ceria. The grain boundary conductivity of Gd-Pr doped ceria is lower than Gd doped ceria. Pr doped samples showed significant electronic transference number.

**H517 - CERIA BASED CERAMICS: EFFECT OF SINTERING AID AND TWO-STEP SINTERING ON THE ELECTRICAL AND MICROSTRUCTURAL PROPERTIES**

Dulcina Pinatti de Souza (UFSCar DEMA) and Glauber Silva Godoi (UFSCar DEMA)

To accomplish an electrolyte with a high EDB (electrolytic domain boundary), ternary electrolytes such as ceria-zirconia-yttria has received attention to substitute doped ceria with only one kind of dopant. The use of alumina as sintering aid and a two-step sintering was also tried in order to minimize some deleterious effects related to high temperature sintering, a common feature related to sintering of powders made by traditional oxide mixture process. By this procedure the possibility to avoid a great segregation of impurities to grain boundary can be accomplished.

**H519 - DEVELOPMENT AND TESTING OF ANODE-SUPPORTED SOLID OXIDE FUEL CELLS WITH SLURRY-COATED ELECTROLYTE AND CATHODE**

M. A. C. Berton (LACTEC), E. N. S. Muccillo (IPEN), Y. V. França (IPEN),  
Fabio C. Fonseca (IPEN), Daniel Z. de Florio (UNESP), C. M. Garcia  
(LACTEC) and R. Muccillo (IPEN)

This work reports the preparation and tests of single Solid Oxide Fuel Cells (SOFCs). For this purpose, several anode-supported single SOFCs of the type (ZrO<sub>2</sub>:Y<sub>2</sub>O<sub>3</sub>+NiO) thick anode/(ZrO<sub>2</sub>:Y<sub>2</sub>O<sub>3</sub>) thin electrolyte/(La<sub>0.65</sub>Sr<sub>0.35</sub>MnO<sub>3</sub>+ZrO<sub>2</sub>:Y<sub>2</sub>O<sub>3</sub>) thin cathode have been prepared by slurry-coating, and tested at 700 and 800 °C after in situ H<sub>2</sub> anode reduction. OCV and current–voltage (I-V) curves were performed at 700 and 800 °C with a Parrstat 2263 potentiostat–galvanostat. The area specific ohmic resistances determined from the polarization curves are ~ 8 and ~ 17 Wcm<sup>2</sup> at 800 and 700 °C, respectively.

**H526 - CHARACTERIZATION AND DEVELOPMENT OF NB2O5-DOPED POROUS ZRO2-TIO2 CERAMIC AS SOIL HUMIDITY SENSOR FOR IDENTIFICATION OF RISK-AREAS IN LANDSLIDE MONITORING**

Maria do Carmo Andrade Nono (INPE), Rodrigo Matos Oliveira (INPE)  
and Marcel Wada (INPE)

Considering the need for acquaintance and follow up of the risk-areas, efforts have been made to develop more versatile, reliable sensors and sensor systems with smaller cost. In this work, the results of the characterization analyses of soil humidity sensor elements of ZrO<sub>2</sub>-TiO<sub>2</sub> doped with 1, 5, 10, 15 e 20 % Nb<sub>2</sub>O<sub>5</sub> porous ceramic, sintered at 1000, 1100 and 1200 °C, are shown and discussed. This is a subject of great originality in world-wide terms, mainly concerning to the influence of the pores form and its size distribution on the capacity of chemical and physical interactions of water molecules with the surface of the sensor material.

**H533 - COMPETITION BETWEEN COEXISTING PHASES IN (LA, PR)CAMNO3 MANGANITES**

Sueli Hatsumi Masunaga (IFUSP) and Renato Figueiredo Jardim (IFUSP)

We have studied the magnetic and transport properties of La<sub>5/8</sub>-yPr<sub>y</sub>Ca<sub>3/8</sub>MnO<sub>3</sub> manganites and determined a well defined region of concentration y where the competition between coexisting ferromagnetic and charge and orbital-ordered insulating phases is much more pronounced, and therefore optimizes the colossal magnetoresistance effect.

**H540 - UNILATERAL FIN LINE DIRECTIONAL COUPLER ON 2D PHOTONIC SUBSTRATE**

Davi Bibiano Brito (UFRN) and Humberto César Chaves Fernandes (UFRN)

The photonic band gap (PBG) crystals have been used as a perfectly reflecting substrate for many millimeter wave applications. In this work the fin line directional coupler with PBG substrate was analyzed using the full wave TTL – Transverse Transmission Line – method. Compared to other full wave methods the TTL is an efficient tool to determine the coupler characteristics. In order to analyze the structure the effective dielectric constant, the attenuation constant and the coupling were determined.

**H541 - SYNTHESIS AND ELECTRICAL CHARACTERIZATION OF CERAMIC THERMISTORS**

**BASED ON MANGANESE, NICKEL AND COBALT OXIDES**

Reginaldo Muccillo (IPEN), Eliana Navarro dos Santos Muccillo (IPEN),  
Odília Cordeiro Ribeiro (IPEN), José Mário Ferreira Jr. (IPEN) and Yone  
Vidotto França (IPEN)

Ceramic powders with composition (NiO)<sub>x</sub>(MnO<sub>2</sub>)<sub>y</sub>(Co<sub>3</sub>O<sub>4</sub>)<sub>z</sub> were prepared by mixing of oxides/carbonates and the polymeric precursor technique. After sintering the pressed powders, the ceramic pellets were analyzed by X-ray diffraction, X-ray fluorescence and scanning electron microscopy. The NTC (negative temperature coefficient) behavior was studied. The results show that irrespective of the preparation technique and the final microstructure, all compositions show NTC behavior.

**H542 - DIP COATED MESOSTRUCTURED SILICA FILMS: TEMPLATE REMOVAL INVESTIGATION**

Jivaldo do Rosário Matos (Universidade de São Paulo), Sylvia Mendes  
Carneiro (Instituto Butantã), Silvana de Albuquerque Maranhão  
(Universidade de São Paulo) and Márcia de Abreu Fantini (Universidade  
de São Paulo)

Dip Coated Mesostructured Silica Films: Template Removal Investigation  
Mesoscopically hexagonal ordered SBA-15 silica films prepared by a synthesis method using sol-gel and dip-coating, onto glass and stainless steel substrates, are described here. Distinct methods of template removal are proposed, in order to investigate structure shrinkage. Transmission electron microscopy and X-ray diffraction measurements were performed to characterize the film's structure. The silica films consist of a regular array of uniform mesopores.

**H543 - SNO2:EU NANOPOWDERS FOR DEVELOPMENT OF GAS SENSORS**

Cláudia Kodaira, Javier Ramirez, Alexandre Honorato, Henrique Peres,  
Pilar Hidalgo, Maria Cláudia Felinto and Hermi Brito

Nanopowders of SnO<sub>2</sub>:Eu were obtained by polymer precursor method. It was observed that Eu+3 ions segregation on the surface of SnO<sub>2</sub> causes a reduction of the crystallite size whereas the specific area increases. Sensors were fabricated as resistors of SnO<sub>2</sub>:Eu 5% thin films obtained by coat-deposition of polymer precursor on interdigitated Au electrodes on alumina substrate and calcined at 500 °C x 4 h. These sensors showed excellent sensitivity to detection of high polarity gases, such as NO<sub>x</sub>, SO<sub>2</sub>, and EtOH at low concentrations (~100 ppm); and very little sensitivity for C<sub>3</sub>H<sub>8</sub> and gasoline.

**H546 - EFFECT OF STRUCTURAL DISORDER ON THE INTENSE PHOTOLUMINESCENCE OF PEROVSKITE BZT**

Antonio Carlos Hernandes (USP-SC-IFSC), Fábio Simões Vicente (USP-SC-IFSC), Sérgio Ricardo Lázaro (UFSCar), Valéria Moraes Longo (UFSCar), Alberthmeiry Teixeira Figueiredo (UFSCar), Ana Paula Azevedo Marques (UFSCar), Laécio Santos Cavalcante (UFSCar), Iêda Lúcia Viana Rosa (UFSCar) and Elson Longo (UFSCar)

In this work, Ba(Zr<sub>0.25</sub>Ti<sub>0.75</sub>)O<sub>3</sub> ordered-disordered structural powders were synthesized by the polymeric precursor method. Material annealed at 573K for different times showed photoluminescence due to the presence of structural disorder. However the powder annealed at 973K for 2 h did not present any photoluminescence since it is highly order in its structure.

### H547 - EVALUATION OF DEEP TRAP RELAXATION AS A FUNCTION OF COO AND MNO AMOUNT IN SnO<sub>2</sub>.COO AND SnO<sub>2</sub>.MNO BINARY SYSTEMS

Paulo Roberto Bueno (IQ-Unesp), Miguel Ángel Ramírez (IQ-Unesp), Mônica Aparecida dos Santos (IQ-Unesp), Elson Longo (IQ-Unesp) and José Arana Varela (IQ-Unesp)

The main purpose of this work is to investigate the deep trap relaxation in SnO<sub>2</sub>.CoO and SnO<sub>2</sub>.MnO binary system. As already know the CoO and MnO densifies the SnO<sub>2</sub>, however the influence of each dopant on the energy level and defects on the band gap is still poorly studied. With the evaluation of CoO and MnO amount on the deep trap relaxation of such polycrystalline binary system we intend to obtain more information on the energy levels caused by such defects. The deep trap relaxation was evaluated by means of impedance and admittance spectroscopy.

### H550 - LITHIUM CONDUCTIVE GLASS CERAMICS OBTAINED BY CONTROLLED CRYSTALLIZATION OF A Li<sub>2</sub>O-AL<sub>2</sub>O<sub>3</sub>-GeO<sub>2</sub>-P<sub>2</sub>O<sub>5</sub> GLASS

AnaAna Candida Martins Rodrigues (UFSCar) and Ana Milena Cruz (UFscar)

A proper composition of the Li<sub>2</sub>O-Al<sub>2</sub>O<sub>3</sub>-GeO<sub>2</sub>-P<sub>2</sub>O<sub>5</sub> glass system was subjected to suitable heat treatments to obtain the highly conductive Li<sub>1.5</sub>[Al<sub>0.5</sub>Ge<sub>1.5</sub>(PO<sub>4</sub>)<sub>3</sub>] phase. The parent 0.05Li<sub>2</sub>O-0.3Al<sub>2</sub>O<sub>3</sub>-0.05GeO<sub>2</sub>-0.6P<sub>2</sub>O<sub>5</sub> glass presented a reduced glass transition temperature  $T_{gr} = T_g / T_m = 0.57$  indicating that this composition nucleates homogeneously. This assumption is corroborated by the analysis of the DSC curves obtained from bulk and powder samples. Thus, different microstructures can be achieved by controlling the temperature and duration of a double heat treatment.

### H556 - DENSIFICATION AND MICROSTRUCTURAL DEVELOPMENT OF THE KSR2NB5O15 DOPED WITH CUO AND B2O3

Silvania Lanfredi (FCT-Unesp), Celso Xavier Cardoso (FCT-Unesp), Delia do Carmo Vieira (FCT-Unesp) and Marcos Augusto de Lima Nobre (FCT-Unesp)

CuO e B<sub>2</sub>O<sub>3</sub> oxides were investigated as liquid phase forming additives in order to enhance the densification process of KSN ceramic at temperature lower than conventional one. The main objective of this work was to investigate the efficiency of CuO and B<sub>2</sub>O<sub>3</sub> as liquid phase forming agent on the sintering process of KSN ceramics. Sintered KSN ceramic reaches density at around 64 % of the theoretical density, while that doped ceramics reach one at around 93 %. Structure and microstructure of ceramics were characterized by X-ray diffraction and scanning electron microscopy (SEM), respectively.

### H557 - IMPROVEMENT OF DIELECTRIC PROPERTIES OF Ba<sub>0.8</sub>Ca<sub>0.2</sub>OtiO<sub>3</sub> FILMS

Jose Arana Varela (UNESP), Elson Longo (UNESP), Edson Roberto Leite (UFSCar), Dulce Maria Melo (UFRN), Ana Paula Marques (UFRN), Marcia Tsuyama Escote (UFSCar) and Fabiana Villela Motta (UFSCar)

Ba<sub>0.8</sub>Ca<sub>0.2</sub>OtiO<sub>3</sub> films have been prepared by chemical route using two different precursors: BaCO<sub>3</sub> and CaCO<sub>3</sub> (BCT201) and Ba<sub>0.8</sub>Ca<sub>0.2</sub>CO<sub>3</sub> (BCT202). The Ba<sub>0.8</sub>Ca<sub>0.2</sub>CO<sub>3</sub> was prepared by co-precipitation stoichiometric of BaCl<sub>2</sub> and CaCl<sub>2</sub> using ammonium carbonate. Dielectric constant and dissipation factor

(tan δ) measurements revealed that the sample BCT201 present dielectric constant values (ε') significantly higher than the obtained for BCT202. A 100 kHz, values were 964 and 648 for BCT201 and BCT202, respectively. These values are superior to the Ba<sub>0.9</sub>Ca<sub>0.1</sub>TiO<sub>3</sub> films reported in literature, ε' ~150.

### H558 - MORPHOLOGICAL STUDY OF COPPER HEXACYANOFERRATE THIN FILM DISPERSED ON THE SiO<sub>2</sub>/ZrO<sub>2</sub>/C-GRAPHITE CARBON CERAMIC ELECTRODE

Yoshitaka Gushikem (UNICAMP) and Eduardo Marafon (UNICAMP)

SiO<sub>2</sub>/ZrO<sub>2</sub>/C-graphite carbon ceramic material was prepared by the sol-gel processing method and used to prepare carbon ceramic electrode. A copper hexacyanoferrate thin film was grown in situ on the electrode surface. The SEM image for SiO<sub>2</sub>/ZrO<sub>2</sub>/C-graphite carbon ceramic electrode shows a smooth surface, while for the copper hexacyanoferrate modified electrode, it was observed an increase in the roughness surface. The thickness of the film was estimated as 110 nm by cyclic voltammetry.

### H559 - ELECTRICAL AND MICROSTRUCTURAL PROPERTIES OF SnO<sub>2</sub> DOPED VARITORS

Marcelo Zampieri (Ufscar), Francini Cristiani Picon (Ufscar), Elson Longo (Unesp), Mário Lúcio Moreira (Ufscar), Rorivaldo Camargo (Ufscar) and Sidnei Antonio Pianaro (Uepg)

The SnO<sub>2</sub>-based varistors powders were calcined and milled by many different times were conformed and then sinterized at 1350 °C for 80 min. The broken-down voltage was range between 1583V/cm for the sample V 60 min and 5116V/cm for the sample V 240 min with alpha ranged 3.3 and 9.2. The gap was a function of the milling times, varied between 3.23 eV for the sample V 15 min and 3.43 eV for the sample V 240 min, in the presence of two crystalline phases, cassiterite (SnO<sub>2</sub>) and the cobalt stannate (Co<sub>2</sub>SnO<sub>4</sub>).

### H560 - CHARACTERIZATION OF PURE AND NIOBIUM DOPED BI4TI3O12

José Arana Varela (IQ - UNESP), Ederson Carlos Aguiar (IQ - UNESP) and Alexandre Zirpoli Simões (IQ - UNESP)

Pure and niobium doped BIT ceramics were prepared by polymeric precursor method, sinterized and investigated by scanning electronic microscope, X-ray diffraction and infrared spectrometry. The results show favored grain growth of ceramics niobium doped, large grains and single phase.

### H561 - ELECTROMECHANICAL PROPERTIES OF CALCIUM BISMUTH TITANATE FILMS: A POTENTIAL CANDIDATE FOR LEAD-FREE THIN-FILM PIEZOELECTRICS

José Arana Varela (IQ - UNESP), Ederson Carlos Aguiar (IQ - UNESP), Alexandre Zirpoli Simões (IQ - UNESP) and Elson Longo da Silva (IQ - UNESP)

CaBi<sub>4</sub>Ti<sub>4</sub>O<sub>15</sub> (CBTi144) thin films were evaluated for use as lead-free thin-film piezoelectrics in microelectromechanical systems. The films grown by the polymeric precursor method on (100) Pt/Ti/SiO<sub>2</sub>/Si substrate present a single phase of layered-structured perovskite with polar-axis-oriented.

### H562 - MICROWAVE-ASSISTED SINTERING OF BZN CERAMICS: A MICROSTRUCTURAL STUDY

Sonia M. Zanetti (INPE) and Sandra A. da Silva (ITA)

Bismuth zinc niobate (BZN) nanopowder was previously obtained by two different techniques: polymeric precursor method and conventional solid-phase synthesis. Pellets of BZN powders prepared by the different routes were sintered in a microwave oven at different temperatures, heating rates, and soaking times and their microstructures were investigated. The main goal of this work is to study the grain size distribution on the microstructure of the BZN ceramics sintered in a microwave oven and to investigate its effect on the electric measurements. For comparison, conventional oven was also used.

### H563 - MICROWAVE ASSISTED HYDROTHERMAL SYNTHESIS OF $\text{NaNbO}_3$ AND $\text{KNbO}_3$ TEMPLATES INTENDING THE TGG METHOD APPLICATIONS

Maria Aparecida Zaghete, Amauri Jardim de Paula (Unesp) and José Arana Varela

The  $\text{NaNbO}_3$  and  $\text{KNbO}_3$  templates (morphologically controlled particles) obtained by microwave assisted hydrothermal synthesis was the prior meaning of this work. The templates production were made objectifying the  $\text{NaKLiNbO}_3$ -based piezoceramics texturization by oriented grain growth technique (TGG), to increase its piezoelectric properties once this ceramic material is a possible PZT piezoceramics substitute. A morphological study based in variances of raw material,  $\text{MOH}/\text{Nb}^{5+}$  ratio (wherein  $M = \text{Na}^+, \text{K}^+$ ) and time of reaction indicated the proper conditions for the templates production.

### H567 - INFLUENCE OF THE ZR CONCENTRATION ON THE PHOTOLUMINESCENCE OF $\text{Ba}(\text{Zr}_{x}\text{Ti}_{1-x})\text{O}_3$

Iêda Lúcia Viana Rosa (UFSCar), Antonio Carlos Fernandes (USP-IFSC), Fábio Simões de Vicente (USP-IFSC), Sérgio Ricardo de Lázaro (UFSCar), Valéria Moraes Longo (UFSCar), Luís Presley Serejo dos Santos (UFSCar), Alberthmeiry Teixeira de Figueiredo (UFSCar), Francini Cristina Picon (UFSCar), Laécio Santos Cavalcante (UFSCar), José Arana Varela (UNESP) and Elson Long (UNESP)

Intense and broad blue and green-yellow photoluminescence bands in structurally disordered  $\text{Ba}(\text{Zr}_x\text{Ti}_{1-x})\text{O}_3$  powders with  $x = 0.00, 0.25, 0.50, 0.75,$  and  $1.00$  were observed at room temperature with laser excitation at  $350.7 \text{ nm}$ . Barium titanate, titanate zirconate and zirconate powders were characterized by the optical absorption measurements and photoluminescence.

### H569 - GRAIN GROWTH AND SINTERING EFFECTS ON THE ELECTRICAL PROPERTIES OF $\text{Nd}^{3+}$ -DOPED PLZT (9/65/35)

Ducinei Garcia (Dpto. de Física, UFSCar), Fidel Guerrero Zayas (Dpto. de Física, UFSCar), Román Alvarez Roca (Dpto. de Física, UFSCar) and José A. Eiras (Dpto. de Física, UFSCar)

The sintering effect in the microstructural and electrical properties of  $\text{Nd}^{3+}$  doped-PLZT (9/65/35) was studied. The samples were obtained by solid-state reaction and sinterized at different temperatures. The grain growth

mechanism is showed and a cubic grain growth law;  $G_3 = K_0 t \exp(Q/RT)$ ; was observed in the samples whit grain size from  $1$  to  $2.35 \mu\text{m}$ . The dependence of the transition parameters ( $\max$  and  $T_{\max}$ ) of the permittivity whit porosity and grain size are studied. The AC conductivity follows the Joncher Law. The behavior of the frequency exponent  $s$  is analised for the Correlated Barrier Hopping (CBH) model. Both, AC and DC conductivities, are correlated with the microstructural evidences.

### H574 - MAGNETIC CHARACTERIZATION OF BARIUM HEXAFERRITE

Ronaldo Ribeiro Correa (CEFET-MA), Danúbia Souza Pires (CEFET-MA), Walter Silva Castro (CEFET-MA) and Aluisio Alves Cabral (CEFET-MA)

A barium hexaferrite ( $\text{BaFe}_{12}\text{O}_{19}$ ) ceramic was obtained from the mixture of barium carbonate with iron oxide, using the high energy milling technique. The particles size and morphology of the sintered samples were followed by Scanning Electron Microscopy (SEM) as a function of different processing conditions. It was observed that the magnetic properties of the  $\text{BaFe}_{12}\text{O}_{19}$  ceramic changed with milling parameters, sintering temperature, which influenced the density, size and the morphology of the particles.

### H577 - TEXTURIZED $\text{NaNbO}_3$ THIN FILMS OBTAINED BY POLYMERIC PRECURSOR

Elson Longo (Unesp), José Arana Varela (Unesp), Edson Roberto Leite (UFSCar), Poty Rodrigues Lucena (UFSCar) and Larissa Roveroni Moraes (UFSCar)

$\text{NaNbO}_3$  has claimed the attention of researchers and designers of equipment owing to its unique physical properties and as a basis for a class of ecologically benign active materials. In this work,  $\text{NaNbO}_3$  thin films were prepared by polymeric precursor method. AFM images showed a homogeneous distribution of particles in the thin films surface.  $\text{NaNbO}_3$  thin films C-V curves display a non linear symmetric profile and a coercitive field of  $2\text{V}$  as in negative as positive regions of polarization. The maximum capacitance value ( $800\text{pF}$ ) was obtained in  $7000\text{RPM}$  and  $600^\circ\text{C}$  thin films.

### H575 - THE INFLUENCE OF PRECURSOR POWDER ON BULK $\text{Bi-2212}$ HIGH-TC SUPERCONDUCTOR

Eduardo Torres Serra (CEPEL), Fernanda Figueiredo dos Santos (CEPEL), Carla Vital de Sena (CEPEL), Luiz Antonio Saleh (CEPEL), Alexander Polasek (CEPEL) and Fernando Cosme Rizzo (PUC-Rio)

The  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_x$  ( $\text{Bi-2212}$ ) oxide is one of the main high- $T_c$  superconductors for applications. In the partial melting process, the precursor is heated above the  $\text{Bi-2212}$  peritectic decomposition temperature, slow-cooled and further annealed. In the present work, commercial and homemade precursor powders were melt-processed into silver molds, forming  $\text{Bi-2212}$  blocks with critical currents of  $90\text{-}135\text{A}$  and critical current densities of  $900\text{-}1350\text{A}/\text{cm}^2$ , at  $77 \text{ K}$ . However, reducing the amount of secondary phases and optimizing the  $2212$  oxygen content may further enhance the performance of bulk  $\text{Bi-2212}$ .

### H578 - MULTIFERROIC $\text{BATIO}_3\text{-COFE2O}_4$ NANOSTRUCTURES OBTAINED BY CHEMISTRY METHOD

Carlos Alberto Paskocimas (UFRGN), Mario Lucio Moreira (UFSCar),

Marcelo Zampieri (UFSCar), José Arana Varela (UNESP) and Elson Longo (UNESP)

Among various magnetoelectric composite systems, BaTiO<sub>3</sub> and CoFe<sub>2</sub>O<sub>4</sub> phases are found to be separated from each other by cooling the eutectic liquid in a unidirectional solidification process, which produces the BaTiO<sub>3</sub>/CoFe<sub>2</sub>O<sub>4</sub> composites with a lamellar morphology. At most of works presented in the literature brings this material synthesized by physics methods like pulsed laser deposition (PLD), with an expensive substrate as SrTiO<sub>3</sub> (001). In this work we searched the synthesis of the BaTiO<sub>3</sub>/CoFe<sub>2</sub>O<sub>4</sub> using the chemical method with the application of the material on Si/SiO<sub>2</sub> (100), that represent

**H580 - EFFECT OF SINTERING ATMOSPHERE ON THE MAGNETIC PROPERTIES OF MNZN FERRITE**

Jeanete Leicht (IPT), Suzilene Real Janasi (IPT), Victoria Lazaro-Colan (USP) and Fernando José Landgraf (USP)

The control of the magnetic losses of manganese zinc ferrites at 0.2T and 100kHz is critical for the performance of power supplies. The losses are related to the magnetocrystalline anisotropy constant K<sub>1</sub>, which varies with temperature and the Fe<sup>2+</sup> content of the material. Measurements of Fe<sup>2+</sup> contents were compatible with the oxygen content of the sintering atmosphere and can explain the temperature behavior of the magnetic losses, which shows a minimum at around 800 C.

**H582 - SYNTHESIS AND DIELECTRIC PROPERTIES OF ER<sup>3+</sup> MODIFIED BaTiO<sub>3</sub> CERAMICS**

Antonio Carlos Hernandez (IFSC, USP), Jean Claude M'Peko (IFSC, USP), José de Los S. Guerra (UFSCar), Maria Ines Bernardi (IFSC, USP), Fidel Guerrero Zayas (Univ de Oriente; UFSCar) and Yurimiler Leyet Ruiz (Univ de Oriente; USP)

The interrelated semiconductor and ferroelectric properties of n-doped BaTiO<sub>3</sub> (BT) ceramics with Positive Temperature Coefficient Resistance (PTCR) characteristics were considered for describing their electrical properties in a large range of temperatures. This effect can be induced if acceptor species, in the sites of either Ba or Ti, are introduced in the BT matrix. In this work we present the microstructural characterization and electrical properties of pure and doped ceramics of barium titanate with 1 mol % of erbium (BET). The ceramics were obtained by the polymeric precursor method. The ceramics have perovskite structure and do not contain pyrochlore phase for the erbium doped ceramics. The average grains size and densities (up to about 95% of theoretical density) of the sintered materials are reported. The incorporation of 1 mol% Er<sup>3+</sup> in the Ba<sup>2+</sup> sites seen to induce a modest PTCR effect for the sintering conditions considered

**H588 - PHASE TRANSITION AND FERROELECTRIC PROPERTIES IN PBN 56/44 CERAMICS**

Ducinei Garcia (UFSCAR), José Antonio Eiras (UFSCAR), Michel Venet (UFSCAR) and Fabio Luis Zabotto (UFSCAR)

Tungsten-bronze ferroelectric materials are interesting because they can display larger piezoelectric effects than the others ferroelectric materials. An important solid solution of the TB ferroelectric families is the lead barium niobate system, or PbxBa<sub>1-x</sub>Nb<sub>2</sub>O<sub>6</sub> (PBN). In this work the phase transition of the ferroelectric ceramics of the system PBN with x=0.56 was investigated using different techniques. The analysis consisted on measurements of

some properties like dielectric, dilatometric and piezoelectric as function of temperature as well ferroelectric and strain as function of frequency.

**POSTER SESSION PH2 - TUESDAY, OCTOBER 10**

**H501 - CHARACTERISTICS OF ELECTROMAGNETIC RADIATION ABSORPTION IN PLAIN COVERINGS WITH FERRITE MG-MN**

Carlos Alberto Reis Freitas (IEAv)

Characteristics of Electromagnetic Radiation Absorption in Plain Coverings with Ferrite Mn-Mg The production technology of covering electromagnetic radiation absorbers of the blanket type is related with the development of new materials and its electromagnetic properties. In this paper it is presented a methodology of one layer plain covering production, with absorption characteristics tuned in the frequency of 9 GHz. These coverings have been confectioned joining ferrite powder of Mg-Mn with aliphatic resin with base epoxy. Reflectivity measurements have been carried out in three samples with different compositions, in the 8 to 12 GHz frequency range, to study its electromagnetic radiation absorption characteristics. The reflectivity data are presented and compared between the different samples.

**H503 - INFLUENCE OF THE RARE EARTH SUBSTITUTION ON THE MAGNETIC AND DIELECTRIC PROPERTIES OF BIFEO<sub>3</sub> MULTIFERROIC MAGNETOELECTRIC CERAMICS**

Suzana Nóbrega de Medeiros (UEM), Helder Luciani Casa Grande (UEM), Valdirlei Fernandes Freitas (UEM), Andrea Paesano Jr. (UEM) and Ivair Aparecido Santos (UEM)

Multiferroic magnetoelectric compounds are materials that show electric and magnetic ordering in the same phase. In this work, pure and Eu or Mn modified BiFeO<sub>3</sub> magnetoelectric compounds were processed by high-energy ball milling and structurally, microstructurally and magnetically investigated. The refinements results pointed out for distorted rhombohedral perovskite structure and corroborate the microstructural ones, whereas no morphologic or compositional alterations were observed. Magnetization results showed alterations in the properties of the all studied samples.

**H506 - SIMULATION OF THE OXYGEN AND CARBON MONOXIDE PROFILES IN SnO<sub>2</sub>-BASED THICK FILMS**

Miriam S. Castro (INTEMA (CONICET-UNMdP)), Celso M. Aldao (INTEMA (CONICET-UNMdP)) and Miguel A. Ponce (INTEMA (CONICET-UNMdP))

The dependence of the electrical conductivity of SnO<sub>2</sub> thick films under carbon monoxide was studied. Assuming carbon monoxide diffusion through the film and the consequent reaction with the previously adsorbed oxygen, carbon and oxygen transient profiles were calculated from the continuity equation for each component. A simple model considering CO diffusion through the SnO<sub>2</sub> thick film and the possible reaction with previous adsorbed oxygen reproduces resistance variation with exposition time.

**H514 - A RAMAN AND DIELECTRIC STUDY OF DIFFUSE PHASE TRANSITION IN (Pb<sub>1-x</sub>Ca<sub>x</sub>)TiO<sub>3</sub> THIN FILMS**

Paulo Sergio Pizani (UFSCar), Jose Arana Varela (UNESP), Edson Roberto

Leite (UFSCar), Felon Lima Pontes (UNESP), Debora Lima Pontes (UNESP), Adenilson Jose Chiquito (UFSCar), Marcos Antonio Machado (UFSCar) and Elson Longo

Ferroelectric thin films are attractive for several applications, including dynamic random access memories (DRAMs), infrared sensors, microwave dielectric applications, and nonvolatile memories (NVRAMs). Studies have therefore been performed in  $\text{Pb}(\text{Ti}_{1-x}\text{Zr}_x)\text{O}_3$ ,  $\text{Ba}(\text{Ti}_{1-x}\text{Zr}_x)\text{O}_3$ ,  $\text{Pb}_{1-x}\text{La}_x\text{TiO}_3$ ,  $\text{Pb}(\text{ScTa})_{1-x}\text{Ti}_x\text{O}_3$ ,  $\text{Pb}_{1-x}\text{Ca}_x\text{TiO}_3$  and  $(\text{Pb}_{1-x}\text{La}_x)(\text{Ti}_{1-x}\text{Zr}_x)\text{O}_3$ . Among the perovskite-type structure materials,  $\text{PbTiO}_3$  is one of the ferroelectric compounds with higher transition temperature. It is well known that homovalent and heterovalent substitutions of lead or titanium ions give rise to various behaviors, including relaxor properties, which may appear for some composition-temperature ranges.

### H516 - EFFECT OF LANTHANUM PEROVSKITES ON THE ELECTRICAL AND MICROSTRUCTURAL PROPERTIES OF YTTRIA- DOPED CERIA

Dulcina Pinatti de Souza (UFSCar DEMa) and Glauber Silva Godoi (UFSCar DEMa)

If one intends to use CY as an electrolyte in SOFC it is important to evaluate the possibility of any insulating phase formation involving this material and the cathode material, as doped lanthanum perovskites. In this work two ceramics (solid solutions) were prepared by doping CY powder with cations contained in LSM, composition CY-LSM, and in LSCF, composition CY-LSCF. These solid solutions were prepared in order to enhance a possible structural modification that can occur when the materials get in contact during the cell fabrication and operation as well.

### H518 - ELECTRICAL CONDUCTIVITY OF LSM, YSZ AND LSM-YSZ COMPOSITES

thiago dias (dema/ufscar) and dulcina ferreira de souza (dema/ufscar)

Strontium doped lanthanum manganite (LSM) is used in solid oxide fuel cells (SOFCs) as cathode due its electrocatalytic property, its stability during the cell operation and its thermal compatibility with yttria stabilized zirconia (YSZ). However, in regions where occurs contact between LSM and YSZ, at high temperature, can occurs ions inter-diffusion modifying the total electrical conductivity of the composite. Impedance spectroscopy measurements allowed to determine that the electrical conductivity of zirconia grain in the 10 and 20 vol.% of LSM composites is smaller than in pure YSZ.

### H521 - THE INFLUENCE OF $\text{Fe}_2\text{O}_3$ IN THE HUMIDITY SENSOR PERFORMANCE OF $\text{ZrO}_2:\text{TiO}_2$ POROUS CERAMICS

Eliana Navarro dos Santos Muccillo (IPEN), Ivana Conte Cosentino (IPEN) and Reginaldo Muccillo (IPEN)

The effect of  $\text{Fe}_2\text{O}_3$  on the electrical properties of  $\text{ZrTiO}_4$  was studied taking into account the humidity sensing ability of porous zirconium titanate compounds. The  $\text{ZrTiO}_4$  powders were characterized by X-ray diffraction, mercury porosimetry, scanning electron microscopy and impedance spectroscopy. The impedance spectroscopy data were collected at room temperature under different humidity conditions. The use of  $\text{Fe}_2\text{O}_3$  as sintering aid reduced the porosity of the specimens, but increased the electrical response under humid environments in comparison with specimens sintered without  $\text{Fe}_2\text{O}_3$ .

### H523 - MICROSTRUCTURE AND PHASE TRANSITION IN $\text{La}_2\text{Mo}_2\text{O}_9$

Eliana Navarro dos Santos Muccillo (IPEN) and Renata Ayres Rocha (LEPMI)

In this study the  $\text{La}_2\text{Mo}_2\text{O}_9$  compound was prepared by the polymeric precursor technique and sintered at several temperatures and times. The aim of this work was to study the effects of processing conditions on microstructure and in the phase transition of this compound. The main results show that nanosized powders of  $\text{La}_2\text{Mo}_2\text{O}_9$  were successfully prepared by this technique. X-ray diffraction patterns evidence spurious peaks independent on the processing procedures. The morphology of sintered pellets and the thermodynamic nature of phase transition are dependent on the sintering conditions.

### H524 - PHOTOLUMINESCENCE AT ROOM TEMPERATURE IN $\text{SrBi}_2\text{Nb}_2\text{O}_9$ POWDERS OBTAINED BY SOFT CHEMISTRY ROUTE

Edson Roberto Leite (DQ-UFSCar), Laécio Santos Cavalcante (DQ-UFSCar), Diogo Paschoalini Volanti (IQ-UNESP) and Elson Longo da Silva (IQ-UNESP)

$\text{SrBi}_2\text{Nb}_2\text{O}_9$  (SBN) powders were synthesized by the polymeric precursor method and annealed for different temperatures. Photoluminescence at room temperature was observed only in disordered powders and Raman spectroscopy shows the phase transition between fluorite and perovskite structures in this material.

### H525 - DIELECTRIC PROPERTIES OF CZT THIN FILMS PREPARED BY CHEMICAL SOLUTION DEPOSITION

Sérgio Cava (UEPG), Iêdo Alves Souza (Unesp), Alexandre Zirpoli Simões (Unesp), Laécio Santos Cavalcante (Unesp), Luiz Ferreira Lima Jr (Unesp), Elson Longo (Unesp) and José Arana Varela (Unesp)

The  $\text{Ca}(\text{Zr}_{0.05}\text{Ti}_{0.95})\text{O}_3$  (CZT) films annealed at 928K for 4 hours were grown on  $\text{Pt}(111)/\text{Ti}/\text{SiO}_2/\text{Si}(100)$  substrates by the chemical method. CZT films present orthorhombic structure with a crack free and granular microstructure. Dielectric constant and dielectric loss of the films was 212 at 100 kHz and 0.032 at 1 MHz.

### H528 - STUDY OF THE STRUCTURAL EVOLUTION OF BZT THIN FILMS BY THE PHOTOLUMINESCENCE

Miriam Ricon Joya (UFSCar), Maria Teresa Fabbro (UFSCar), Diogo Paschoalini Volanti (UNESP), Maria Fernanda Carmo Gurgel (UFSCar), Laécio Santos Cavalcante (UFSCar), Iêda Lúcia Viana Rosa (UFSCar) and Elson Longo (UNESP)

$\text{Ba}(\text{Zr}_{0.25}\text{Ti}_{0.75})\text{O}_3$  disordered and ordered films were synthesized by the polymeric precursor method. The films annealed at 400 °C for different times presented the photoluminescence due to the presence of structural disorder, while the film annealed at 700 °C for 2 h did not present any photoluminescence, characterizing the structural order.

**H530 - LOW SINTERING TEMPERATURE AND ELECTRICAL PROPERTIES OF SAMARIUM DOPED CERIA**

Eliana Navarro Muccillo (IPEN) and Eduardo Caetano Souza (IPEN)

Since 1988, Ce<sub>0.8</sub>Sm<sub>0.2</sub>O<sub>1.9</sub> has been extensively studied to be used as solid electrolyte in solid oxide fuel cells that operate at intermediate temperatures (500-600 °C). Efforts have been devoted during recent years to the development of wet-chemical techniques of synthesis, aiming to improve the structure/electrical properties of nanostructured materials. In this work, the influence of some alcoholic solvents on the homogeneous precipitation method was analyzed. Green compacts could attain a high densification at a temperature of 1200 °C and low electrical resistivity value was obtained.

**H531 - B<sub>2</sub>O<sub>3</sub>-ADDED Ba<sub>2</sub>Ti<sub>9</sub>O<sub>20</sub> NANOPOWDER AND CERAMICS SYNTHESIZED BY A HYBRID CHEMICAL AND CO-PRECIPITATION METHOD**

Pedro J. Castro (INPE), Sonia M. Zanetti (INPE) and Maria C. A. Nono (INPE)

A hybrid chemical and co-precipitation method was used to synthesize a 5 wt% B<sub>2</sub>O<sub>3</sub>-added Ba<sub>2</sub>Ti<sub>9</sub>O<sub>20</sub> nanopowder. XRD results showed that the powder calcined at 900°C for 2 h presented already the BTO phase along with secondary phases which almost disappeared at 1100°C. Ceramics prepared by pressing and sintering at 1050°C for 3 h presented K = 41.4, Q = 3400, and resonance frequency at 5.60 GHz. These results suggest that this method allows lowering the BTO phase crystallization and ceramics sintering temperatures, which make them suitable for microwave resonator applications.

**H532 - EFFECT OF THERMAL HISTORY ON ELECTRICAL CONDUCTIVITY OF SODA-LIME-SILICATE GLASSES**

Ana Candida Martins Rodrigues (DEMa, UFSCar) and Mariana Moura Machado (DEMa, UFSCar)

We present experimental data on the electrical conductivity behavior of soda-lime-silicate glasses when submitted to different thermal treatments, which lead to different fictive temperatures. The change in electrical conductivity is mainly due to the structural relaxation. Thus, structural relaxation time was calculated using a modified Maxwell expression, whose parameters "tau" and "beta" were determined by fitting.

**H534 - NANOSCALE OBSERVATION OF FERROELECTRIC DOMAINS BY ATOMIC FORCE MICROSCOPY IN SEMICONDUCTING BARIUM TITANATE**

Pedro Íris Paulin Filho (UFSCar) and Marília Wellichan Mancini (UFSCar)

A key feature of ferroelectrics which singles them out among any other material is the fact that its spontaneous polarization can be reoriented through the application of an external electrical field. Such switchable electric polarization makes them ideal for applications such as devices for memory storage and integrated microelectronics. In this work, we investigate the domain structure by atomic force microscopy (AFM) in the semiconductor La doped barium titanate system (Ba<sub>1-x</sub>La<sub>x</sub>TiO<sub>3</sub>), x=0,003, showing Curie temperature around 120°C and a tetragonality described by c/a=1,008.

**H535 - STRUCTURAL PHASE TRANSITION IN 0.65Pb(Mg<sub>1</sub>/3Nb<sub>2</sub>/3)-0.35PbTiO<sub>3</sub> SINGLE CRYSTAL STUDIED BY INFRARED SPECTROSCOPY**

Antônio Carlos Hernandez (USP-SC), João Carlos Silos Moraes (UNESP), Eudes Borges de Araújo (UNESP), Keizo Yukimitu (UNESP) and Cristiano Alves Guarany (UNESP)

The present work reports studies on structural phase transition for 0.65Pb(Mg<sub>1</sub>/3Nb<sub>2</sub>/3)-0.35PbTiO<sub>3</sub> single crystal, using infrared spectroscopy technique. The samples were mounted inside a cryostat attached on the spectrometer and each spectrum was recorded at temperatures between 100 K and 470 K. In order to analyze the infrared spectra as a function of temperature, each spectrum was fitted individually using the least-square method. The IR absorption band is associated to BO<sub>6</sub> octahedral. Singularities observed between 198 K and 300 K suggested possible monoclinic-tetragonal phase coexistence.

**H537 - PROBING BY IMPEDANCE SPECTROSCOPY THE INTERGRANULAR MODIFICATION IN ZIRCONIA-CALCIA SOLID ELECTROLYTES**

Eliana Navarro dos Santos Muccillo (IPEN), Érica Caproni (IPEN), Daniel Zanetti de Florio (UNESP) and Reginaldo Muccillo (IPEN)

The effect of boron oxide addition on the properties of zirconia:calcia solid electrolytes was studied by X-ray diffraction, impedance spectroscopy, and scanning electron microscopy. Calcia fully stabilized zirconia sintered with 0.5 mol% boron oxide addition shows slight improvement in the apparent density as well as in the value of the ionic conductivity. A detailed analysis of the electrical data of pellets sintered with boron oxide addition shows a medium frequency response related to an intergranular region modified by liquid phase sintering, also observed by scanning electron microscopy.

**H539 - A NEW CHEMICAL ROUTE TO OBTAIN NANOMETRIC OXIDE GRAINS**

Elson Longo (UNESP- Araraquara), Marcia Tsuyama Escote (UNESP- Araraquara), Viviane Cristina Albarici (UFSCar), José Arana Varela (UNESP- Araraquara) and Edson Roberto Leite (UFSCar)

This work describes the synthesis of ferroelectric nanoislands by immersion of Si(100) substrates in a Pb-Zr-Ti-O polymeric resins. Microstructure analyses of these substrates revealed the presence of isolated homogeneous nanometric grains of these oxides. The results indicated that this methodology allowed the production of isolated nanoislands

**H544 - LUMINESCENT STUDY OF SnO<sub>2</sub>:Eu<sup>3+</sup> NANOPOWDERS PREPARED BY PECHINI METHOD**

Hermi Brito, Maria Claudia Felinto, Cláudia Kodaira, Pilar Hidalgo and Henrique Peres

Nanopowders of SnO<sub>2</sub>:Eu<sup>3+</sup> are prepared by Pechini method. X-ray diffraction and infrared spectroscopy are used to characterize the material. The results show that Eu<sup>3+</sup> ions induce lower crystallite sizes and promote basicity of the surface. Photoluminescent properties are studied based on 4f6-intraconfigurational transitions, showing the existence of two types of local environments around Eu<sup>3+</sup> ion, probably located into lattice of tin oxide and segregated on the surface of SnO<sub>2</sub>. The segregation of Eu<sup>3+</sup> ions on SnO<sub>2</sub> surface lead these materials to be used as potential gas sensors.

### H549 - STRUCTURAL REFINEMENT IN THE $\text{Fe}_2\text{O}_3 - \text{Al}_2\text{O}_3$ FERROELECTROMAGNETIC MATERIALS

João Batista Marimon da Cunha (UFRGS), Ivair Aparecido dos Santos (UEM), Andrea Paesano Jr (UEM), Jeferson A Moreto (UNICENTRO), Romeu Miquéias Szmoski (UNICENTRO) and Luiz Fernando Cótica (UNICENTRO)

The multiferroic magnetoelectrics have been attracted academic and technological attention. The electric and magnetic order parameter coupling opens the possibility of the integration between the ferroelectromagnetics properties through the magnoelectric effects. Specifically, the  $\text{Fe}_2\text{O}_3 - \text{Al}_2\text{O}_3$  system, particularly the  $\text{FeAlO}_3$  phase, stands out due to its potential applications in electro-electronics, metallurgy and catalyst. In this work, ball-milling and heat treatments were employed to produce this system. Its structural (Rietveld refinement) and Mössbauer spectral properties were investigated

### H551 - THEORETICAL AND EXPERIMENTAL ANALYSIS OF VERY INTENSE BLUE-PHOTOLUMINESCENCE IN STRUCTURALLY DISORDER $\text{SrZrO}_3$

Carlos Alberto Paskocimas (UFRN), Luis Presley Santos (UFSCar), Fábio DE Vicente (USP), Sérgio de Lázaro (UFSCar), Alberthmeiry Teixeira Figueiredo (UFSCar), Júlio Ricardo Sambrano (UNESP), Laécio Santos Cavalcante (UFSCar), Valéria Moraes Longo (UFSCar), Elson Longo (UNESP), Antônio Carlos Hernandez (USP) and José Arana Varela (UNESP)

Highly intense blue-light photoluminescence at room temperature in disordered  $\text{SrZrO}_3$  (SZ) perovskite-like structure were obtained by polymeric precursor method. The emission was so intense that it was possible to see the blue-light at naked eye. The structural order-disorder caused by local oxygen deficiency and local bond distortion yield localized electronic levels in the band gap of this material conducting to a broad blue-light emission. The role of structural order-disorder that favors for the self-trapping of electrons and charge transference in the lattice of SZ is discussed.

### H552 - STUDY OF PIEZOELECTRIC PROPERTIES IN CALCIUM-DOPED PZT

Carlos Oliveira Paiva-Santos (IQ/UNESP), Maria Aparecida Zaghete (IQ/UNESP), Elson Longo (UFSCar), Márcio Souza Góes (IQ/UNESP), Mário Cilense (IQ/UNESP), Margarete Soares Silva (UEMS) and José Arana Varela (IQ/UNESP)

In this work crystalline powders of pure and Ca-doped PZT were obtained by the polymeric precursor method to study microstructure and electrical properties. Was observed that, the addition of Ca on PZT, improves densification and also leads to a homogeneous grain-size distribution. For doped PZT, one observed an increase in the remanent polarization and a decrease in the coercive field, with the increase in dopant concentration. All analyzed samples presented high dielectric constant values and the samples of doped PZT presented piezoelectric charge constant values higher than pure PZT.

### H553 - CURRENT LOCALIZATION AND JOULE SELF-HEATING EFFECTS IN CR-DOPED $\text{Nd}_0.5\text{Ca}_0.5\text{MnO}_3$ MANGANITES

Fabio C. Fonseca (IPEN), Alessandro S. Carneiro (IFUSP) and Renato F. Jardim (IFUSP)

The effects of dc excitation current on the current-voltage curves of polycrystalline samples of  $\text{Nd}_{0.5}\text{Ca}_{0.5}\text{Mn}_{0.96}\text{Cr}_{0.04}\text{O}_3$  were investigated. The experimental results show that an abrupt jump of the voltage is concomitant with a huge increase in the temperature of the sample. A simple model and estimates for Joule self-heating effects support the experimental data. The data strongly suggest that both the current localization in the metallic paths and local Joule self-heating effects are essential ingredients to understand the current-induced phase transition in phase-separated manganites.

### H554 - AC AND DC MAGNETOTRANSPORT PROPERTIES OF THE PHASE-SEPARATED $\text{La}_0.6\text{Y}_{0.1}\text{Ca}_{0.3}\text{MnO}_3$ MANGANITE

Reginaldo Muccillo (IPEN), Eliana N. S. Muccillo (IPEN), José A. Souza (IFUSP), Fabio C. Fonseca (IPEN) and Renato F. Jardim (IFUSP)

Impedance spectroscopy measurements at low temperatures under applied magnetic field up to 1 T were performed in the  $\text{La}_{0.6}\text{Y}_{0.1}\text{Ca}_{0.3}\text{MnO}_3$  manganite. The results show that an interfacial contribution accounts for the magnetoresistance observed. In addition, the temperature dependence of the electrical permittivity is consistent with changes in the concentration of mobile holes charge carriers. Pronounced effects were observed close to metal-insulator transition temperature and were associated with the coexistence of clusters with different electronic and magnetic properties.

### H564 - POWDER PROCESSING OPTIMIZATION OF THE $\text{SnO}_2$ -BASED VARISTORS OBTAINED BY POLYMERIC PRECURSORS

Maria Aparecida Zaguete (IQ-UNESP), Miguel Angel Ramirez (IQ-UNESP), Ederson Miranda Santos (IQ-UNESP), José Arana Varela (IQ-UNESP) and Daniele Bueno Santos (IQ-UNESP)

Ceramic based on  $\text{SnO}_2$  present semiconductivity have been extensively studied and used in technology. Thus, these ceramics, in dense form, can be used as varistors, capacitors, among others. The methods reported to obtain nanoparticles semiconducting oxide include: chemical methods as colloidal growth, hydrothermal synthesis, chemical vapor condensation, spray pyrolysis, and physical method as sputtering and laser ablation. Powders obtained by chemical methods present to homogeneous distribution in the size of the particles, high superficial reactivity that is essential to get dense ceramics. This work has as objective to optimize the processing system 98,9  $0\text{SnO}_2.1,00\text{CoO}.0,050\text{Nb}_2\text{O}_5.0,05\text{Cr}_2\text{O}_3$ . The powder they were obtained by the polymeric precursor method. When the powders were processing without milling the "puff" (polyester decomposed at 400°C for 4 hours) before the final calcination at 600° for 6 hours, the formation of agglomerates in the form of plates is observed. When a homogenization process is developed, after the formation of "puff" (thermally treated at 350°C for 4h) through milling in isopropyl alcohol, very small agglomerated particles are obtained. This milled precursor containing great amount of organic material is heat treated at 400°C for 4 h, sieved through 200 mesh and calcinate at 600°C for 5 h.

### H572 - NONOHMIC PROPERTIES OF $\text{ZnO.COO}$ -BASED POLYCRYSTALLINE CERAMICS

Paulo Roberto Bueno (IQ/UNESP, Araraquara), Miguel Angel de la Rubia (UPM, Madrid), José de Frutos (UPM, Madrid), José Francisco Fernández (ICV/CSIC, Madrid), Miguel Angel Ramirez (POSMAT/UNESP, Bauru), Elson Longo (IQ/UNESP, Araraquara) and José Arana Varela (IQ/UNESP, Araraquara)



SiC was the first polycrystalline ceramic material studied for varistor applications. This system was substituted in the seventies by ZnO. ZnO.Bi<sub>2</sub>O<sub>3</sub>-based varistors are highly complex ceramics, formed by grains of ZnO, which contain other elements in solid solution.

**H573 - SYNTHESIS AND ELECTRICAL CHARACTERIZATION OF STRONTIUM FERRITES**

Aluísio Alves Cabral (CEFET-MA), Ronaldo Ribeiro Correa (CEFET-MA) and Ronald Ribeiro Correa (CEFET-MA)

A strontium ferrite (SrFeO<sub>2.97</sub>) ceramic was obtained using high energy ball milling from the mixture of strontium carbonate and iron oxide. X ray diffraction, density and scanning electron microscopy experiments were carried out to follow the microstructural evolution with the different processing conditions. Dc electrical conductivity measurements showed that the strontium ferrites behave as a semiconductor until certain temperature, where their conductivity increased with temperature.

**H581 - ELECTRICAL AND STRUCTURAL PROPERTIES OF MN DOPED LACRO3 FILMS**

Alzimar Fernandes Gomes (FAETEC), João Paulo Pinto Braz (UENF) and Herval Ramos Paes Jr. (UENF)

The effects of deposition parameters, doping concentration and heat-treatment temperature in the electrical and structural properties of manganese doped lanthanum chromite films deposited by spray-pyrolysis were investigated, owing their application as interconnector in intermediate temperature solid oxide fuel cells (IT-SOFC). It could be noticed that an initial increment in the doping concentration propitiates a decrease in the film's electrical conductivity and after, at a certain Mn concentration the conductivity starts to increase and it is related to a change of the conduction process.

**H583 - SYNTHESIS AND ELECTROCHEMICAL CHARACTERIZATION OF NANOMETRIC FILMS SnO<sub>2</sub>-BASED FOR STEEL CORROSION PROTECTION**

Emilio Azevedo (CEFET-MA), Marcelo Moizinho Oliveira (CEFET-MA), Auro Atsushi Tanaka (UFMA), José Hilton Gomes Rangel (CEFET-MA), Paulo Roberto Garcês Gonçalves Jr (CEFET-MA), Elson Longo (UFSCAR) and José Arana Varela (UNESP)

In this work, the polymeric precursors method was used to synthesize films nanometric ceramic of SnO<sub>2</sub> and TiO<sub>2</sub>-based. The steel 304 was substrat used for deposition of the films. After the synthesis of the films, they were deposited by dip coating and spin coating and calcinated to 400°C/ 2h. the characterization of the samples was made through MEV and the electrochemical measures were obtained from curve of potentiodynamic polarization in solution eletrolyte of H<sub>2</sub>SO<sub>4</sub> 0,5M. The micrographs show the thickness of the order of 75nm and the surface show pores of the coatings.

**H585 - STRUCTURAL STUDY OF CERAMIC [(CeO<sub>2</sub>)<sub>0.8</sub>(SmO<sub>1.5</sub>)<sub>0.2</sub>]<sub>1-y</sub>(TiO<sub>2</sub>)<sub>y</sub> BY RIETVELD METHOD**

Alberto Adriano Cavalheiro (Unesp), Ariovaldo de Oliveira Florentino (Unesp), Tiago José Pereira (Unesp), Sidney Domingues (Unesp) and Margarida Juri Saeki (Unesp)

Doped cerium oxide exhibits superior conduction compared to other well known ionic conductors so that it has received considerable attention to be applied as electrolyte in a solid oxide fuel cell (SOFC). Pure CeO<sub>2</sub> shows n-type electronic conduction which is associated to the electron hopping between Ce<sup>+3</sup> and Ce<sup>+4</sup>. Aliovalent dopant is added to create oxygen ion vacancy, increase the ionic and suppress the electronic conduction.

**H586 - FE3O4 OBTAINED BY OXIDATION OF FE ELECTRODEPOSITED THIN FILMS**

Nicolás Garcia Garcia (CSIC), André Avelino Pasa (UFSC), Maximiliano Luis Munford (UFSC), Vinicius Claudio Zoldan (UFSC) and José Santos Cruz (UFSC)

We reported the preparation and magnetic properties of magnetite (Fe<sub>3</sub>O<sub>4</sub>) thin films obtained by oxidation of Fe films in both open and CO/CO<sub>2</sub> atmospheres in a horizontal furnace. The observed magnetoresistance at room-temperature was 1.4 %. The Fe deposits were prepared with varying thicknesses from 50 to 200 nm on silicon substrates from a bath containing iron sulfate and boric acid by electrochemical deposition.

**H589 - STUDY OF THE MILLING PROCESS INFLUENCE ON THE ELECTRICAL PROPERTIES OF Nd<sup>3+</sup> DOPED PLZT CERAMICS**

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Adequately lanthanide doped PLZT ceramics have received increased attention, in the last years, as good as laser active media, principally due the versatility on the ceramics syntehsis. In this work, a study based on the lanthanide ion incorporation on the PLZT matrix and the influence on the electrical and optical properties was carried out. The ceramic powder on the ratio La/Zr/Ti = 9/65/35 doped with 1,0 % wt. of Nd<sub>2</sub>O<sub>3</sub> was obtained by low cost solid state conventional method, milled by micro-milling or conventional milling process, and densificate by uniaxial hot press sintering method.