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:

Antonio Eduardo Martinelli (DEME-UFRN)

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Lanthanum nickelate is an interesting material for applications as electrodes in DRAM memories that utilizes peroviskite type dielectrics, because of its metallic behavior and improvements on fatigue properties of these devices. The microwave frequency source of energy is being developed as a new way to process materials. The microwave processing method has several advantages over conventional processes, among then rapid and uniform heating, lower sintering temperatures and cost savings in terms of energy and time. In this work, LaNiO3 thin films were deposited by the polymeric precursor method on SrTiO3(100) substrate. A pre-heating treatment was made in a conventional furnace to eliminate organic materials and after that the films were crystallized in a microwave oven at 700C for ten minutes. These films were characterized by X ray diffraction, AFM and electrical transport measurements. The XRD analysis showed a single-phase film with (100) preferred orientation. The AFM images revealed a smooth and crack free surface, with roughness of 4.6nm. A near metallic behavior was observed in the temperature dependence of the electrical resistivity between 20 and 300K, and its value at room temperature is 500(micro-ohms).cm.

E - O017 ELECTRICAL AND MICROSTRUCTURAL CHARACTERIZATION OF ZRO2_TIO2 CERAMICS PREPARED BY A MODIFIED SOL-GEL TECHNIQUE

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ZrO2-TiO2 nanometric ceramic powders were prepared by a modified sol-gel method. The raw materials were zirconium isopropoxide and titanium oxichloride. The calcination was performed at 450 oC/1h resulting in nanosized ZrTiO4 orthorhombic powders. After pressing and firing at 300 oC/3h and 400 oC/3h, a small amount of monoclinic ZrO2 was observed by X-ray diffraction. The open porosities determined by mercury porosimetry are close to 45% for all samples. The electrical characterization was carried out at room temperature by electrochemical impedance spectroscopy under 60% and 84% relative humidity. The electrical conductivity of zirconia-titania ceramics increases as a function of the relative humidity due to the water adsorption on the porous surface. The behavior of the conductivity with humidity is found to be advantageous for application as humidity sensors.

E - O018 INVESTIGATION OF FERROELECTRIC DOMAIN STRUCTURES BY ATOMIC FORCE AND OPTICAL MICROSCOPIES

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Ferroelectric materials have offered a tantalizing potential for technological applications since their discovery more than 80 years ago. However, the miniaturization of electrical devices due to the nanotechnology advances as well as the development of domain engineering devoted to creation of domain structures with desirable parameters have demanded in situ characterization of ferroelectric domain structures. Such investigation is fundamental to understand the macroscopic behavior of ferroelectric materials for practical applications. In this context, ferroelectric domain image assisted by contact mode atomic force microscopy (AFM) and optical microscopy (OM) have extensively been used to investigate ferroelectric domain patterns even at nanometer scale. The objective of this work is to investigate the ferroelectric domain structures of Ba1-xCaxTiO3 (BCT) fibers produced by laser heated pedestal growth technique by using atomic force and optical microscopies. The results revealed that the domain patterns are strongly influenced by Nd-doping and mechanical stress introduced by polishing process. It was seen that domains for as-grown non-doped BCT fibers are bended between pinning sites, which are released after annealing at high temperatures or by Nd-doping. In addition, the ferroelectric domain patterns of BCT are compared to (1-x)Pb(Mg1/3Nb2/3)O3-xPbTiO3 single crystals.

E - O019 BA1-XSRXTIO3 THIN FILMS CRYSTALLIZED USING A LOW POWER MICROWAVE OVEN

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Ba1-xSrxTiO3 thin films were produced by the polymeric precursor method using an aqueous solution. The crystallization of the films was carried out using a domestic microwave oven by means of a SiC susceptor in order to absorb the microwave energy and rapidly transfer the heat to the film. Low microwave power and short time have been used. The films obtained are well-adhered, homogeneous and with good specularity, even when treated at 600 degreesC for 10 min. The microstructure and the