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P.116	Dielectric properties of 5% Ce-doped BaTiO₃ ceramics: The role of Ti stoichiometry
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The microstructure, as well as the dielectric behaviour and non-linear characteristics versus temperature of Ba_{0.95}Ce_{0.05}TiO₃ and Ba_{0.95}Ce_{0.05}Ti_{0.9875}O₃ ceramics were investigated. Ce-doped BaTiO₃ ceramics were produced from powders synthesized by Pechini method. The nanopowders were densified at different temperatures. Dense ceramics with homogeneous microstructures, low losses and high dielectric constant were obtained for all the compositions. Impedance spectroscopy in the temperature range of -150 -150°C demonstrated the ferro-para phase transition around 25 -35°C for the non-stoichiometric Ba_{0.95}Ce_{0.05}Ti_{0.9875}O₃ samples, as well as for the stoichiometric Ba_{0.95}Ce_{0.05}TiO₃ ceramic sintered at 1200°C. Only the stoichiometric composition sintered at 1300°C presents a shift of its Curie temperature above 100°C, which might be related to small amounts of secondary phases and/or local compositional inhomogeneity which should be further investigated. Very high values of permittivity and sharp ferro-para phase transition are obtained for the composition with Ti-vacancies sintered at higher temperature. Values of tunability in the range of 1.60 to 1.90 at a field of 20 kV/cm are characteristic for all the samples. Landau-Ginzburg-Devonshire theory and its approximation (Johnson relation) approach in case of a single polarization mechanism in the polar state very well fit the experimental data. In the paraelectric phase, a model of random uncorrelated non-interacting dipolar units in a double well potential was considered to describe the dielectric non-linearity. The tunability behaviour was discussed in terms of the role of microstructure, composition and Ti vacancies.

P.117	Thickness dependence of ferroelectric and piezoelectric properties in epitaxial PZT thin films
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Epitaxial (110)-oriented Pb(Zr_{0.52}Ti_{0.48})O₃ (PZT) thin films were fabricated on SrRuO₃-coated (001) YSZ/Si and SrRuO₃-coated (110) SrTiO₃ (STO) substrates with various thicknesses ranging from 0.1 μm to 1.0 μm by pulsed laser deposition. The effects of the film thickness on the structure, ferroelectric and piezoelectric properties were systematically investigated as a function of the film thickness. On the STO substrate the remnant polarization of the films increased from 36.6 to 45.5 μC/cm² with the increasing film thickness, while in the films on the silicon substrate the remnant polarization was in the range of 12.4 - 20.2 μC/cm². The improvement of the remnant polarization with increasing film thickness was due to the reduction of the film/electrode interface effect which leads to improve the switching of domains. The films on the STO substrate were in a compressive stress, while in the films on the silicon substrate a higher tensile stress was found. Compressive stress causes the ferroelectric domains to orient along the longitudinal direction (*c*-domain orientation), which in turn can result in an increase of

the polarization. Moreover, the effective piezoelectric coefficient of the PZT thin films increased steady with increasing thickness. This effect is likely related to a mechanism of elastic domains that can move more easily in thicker film, and that give rise to out-of-plane piezoelectric displacement.

P.118	<p>Influence of annealed atmosphere and poling on dielectric and transport properties of “hard” PZT ceramics</p> <p>Maxim Savinov¹, Stanislav Kamba¹, Karel Nejezchleb²</p> <p>¹Dielectric, Institute of Physics ASCR, Prague, Czech Republic, 182 21; ²Research Department, Noliac Ceramics s.r.o., Librice, Czech Republic, 503 44</p>
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Lead zirconate titanate $\text{PbZr}_x\text{Ti}_{1-x}\text{O}_3$ (PZT) is nowadays the most used piezoelectric material due to its exceptionally high piezoelectric parameters, which are the highest among all piezoelectric ceramics.

In this work we investigate dielectric permittivity and conductivity of hard $\text{Pb}_{0.95}\text{Sr}_{0.05}(\text{Ti}_{1-x}\text{Zr}_x)\text{O}_3$ ($x = 0.53$) ceramics doped with 0.3% wt. of Fe_2O_3 . The measurements were performed at frequencies from 10^{-2} Hz to 10^6 Hz and at temperatures between 300 and 800 K. Temperature dependence of permittivity in poled PZT ceramics does not exhibit any peak up to 750 K (heating rate 5 K/min), although the ferroelectric-paraelectric phase transition should occur around 600 K. The ferroelectric phase is overheated due to local strain and paraelectric phase appears at 750 K only within one hour dwelling time.

Influence of annealing in air, O_2 and N_2 performed at 875 K was as well investigated. We found that the annealing in O_2 and air enhances conductivity and dielectric loss, while the annealing in N_2 reduces conductivity and losses. The influence of annealing is enhanced, if we measure at 475 K and the annealing time is longer. This discovery explains why the PZT ceramics can be more easily poled at 475 K, if the ceramics were first annealed in N_2 atmosphere.

P.119	<p>Intense photoluminescence emission at room temperature at calcium copper titanate powders</p> <p>Francisco M. Filho, Alexandre Z. Simões, Elson Longo, Manuel R. Silva</p> <p>¹Chemistry and Physics, Federal University of Itajubá, Itabira, Minas Gerais, Brazil, 35900-37; ²Materials and Technology, São Paulo State University, UNESP, Guaratinguetá, São Paulo, Brazil, 12516-410; ³Physics, São Paulo State University, UNESP – Chemistry Institute, Araraquara, São Paulo, Brazil, 14801-907</p>
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In this work a study was undertaken about the structural and photoluminescent properties at room temperature of $\text{CaCu}_3\text{Ti}_4\text{O}_{12}$ (CCTO) powders synthesized by a soft chemical method and heat treated between 300 and 800 °C. The decomposition of precursor powder was followed by thermogravimetric analysis (TG-DTA), X-ray diffraction (XRD), Fourier transform infrared (FT-IR), Fourier transform Raman (FT-Raman) and photoluminescence (PL) measurements. XRD revealed that the powders annealed at 800 °C are free of secondary phases and crystallizes in the cubic structure. The most intense PL emission was obtained for the sample calcined at 600 °C, which is neither highly disordered (400-500 °C), nor completely ordered (800 °C). The lower wavelength peak is placed around 480 nm, and the higher wavelength peak at about 590 nm. The UV/vis absorption spectroscopy measurements suggested the presence of intermediary energy levels in the band gap of structurally disordered powders.