Design and characterization of electrical and micro-structural features of oxide ceramics for applications

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Overview

The multiferroics term describes materials, which exhibit at least two ordering in the same phase. Multiferroics meet a revival of interest because of possible applicability. The actual features of double oxide samples rely on method and procedure of synthesis, type of defects, concentration of doping ions, and thermodynamic treatment of the samples. Consequently, modifications of the dielectric features of materials are presumed since the doping with hetero-valence ions can introduce electric dipoles and increased disorder of the structure. It occurs that the chemical composition differs locally from nominal one. The local non-homogeneity influences both the electric conductivity and the kinetics of phase transitions. The analysis of temperature dependent impedance spectra enabled us to determine relaxation processes. The Fermi glass manifested as the variable range hopping of small polarons mechanism of electric conductivity. The conditions necessary for metal-insulator transition induced by electro-formation were determined. The axial and hydrostatic pressures were applied to recognize the ferroelastic effects on the phase transitions.

Such fascinating effects are reported for the perovskite ABO_3 structure. The features of these materials were studied by various methods. There are still opened issues related to the non-homogeneity, clustering and separation of phases. The multiferroic solid solutions, composites, and nanostructures would be used for sensors, transducers, and memory devices for technical purposes. The scope of this course focuses on electrical and structural features of the oxide crystals and ceramics. The lectures show influence of processing, doping with hetero-valence ions, oxygen deficiency, role of applied pressure and strains on electric properties of the studied oxides. Course participants will learn these topics through lectures and supplementary tutorials, which should be taken together.

Modules	**Multiferroic technology: September 11 - September 15 , 2017** **Number of participants for the course will be limited to fifty.**
You Should Attend If…	▪ you are physicist, engineer or research scientist interested in studying structural, ferroelastic and electric ordering phase transition influenced by doping. ▪ you are physicist interested to learn how compositional disorder or chemical non-homogeneity influence the phase transitions and may produce glassy behavior related to electrical features of solid-state materials. ▪ you are physicist interested to learn how to determine relaxation processes in double oxides using impedance spectroscopy.
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $200** **Industry/ Research Organizations: 2000** **Academic Institutions: 1000** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Doctor *habilitatus* Andrzej Molak works as professor's assistant in the Institute of Physics of University of Silesia, Poland. His research includes determination of features of structural transitions between phases showing para-, ferro-, and antiferroelectric order affected by defects; determination of compositional non-homogeneity influence on metal-insulator type phase transitions in the in ABO_3 structure perovskites. He studies effects of structural disorder induced by manganese doping ions and oxygen defects on dispersion of electric permittivity and electric conduction in crystals and ceramics of double oxides materials.

Dr. Dev Kumar Mahato is an Assistant Professor of National Institute of Technology, Patna. His research interest is nano- and bulk-complex perovskite materials and nano-ferrites. The composites forming multiferroic structures are under current research.

Course Co-ordinator

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