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Ferroic inorganic perovskites used in electronics: from nanopowders to micro- and nanostructured ceramics

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Biography

Adelina-Carmen Ianculescu has completed her PhD at politehnica university of bucharest, Romania. She was senior scientist at the institute of physical chemistry of the romanian academy and to the university Paul Sabatier III, Toluouse, France. She is full professor of "Ceramics science and technology - electroceramics" and "oxide nanomaterials" at the department of science and engineering of oxide materials and nanomaterials, faculty of applied chemistry and materials science of "politehnica" university of bucharest. She was also visiting professor of university iimoges, France. During the last three decades, her research activity have dealt with composition - structure - properties correlations in advanced multifunctional electroceramics, "size effects" in nanostructured oxide systems and oxide catalysts. She has over 140 publications and have been cited over 2245 times. Her publication H-index is 29 (Scopus). She is member of the Council of the european Ceramic Society and of the international committee of the electroceramics network.

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Undoped, as well as A and B-site doped BaTiO3 nanopowders were prepared by wet chemical methods. Electron microscopy investigations emphasized the significant influence of the synthesis conditions and sintering strategy in controlling particle size and morphology. An exhaustive study was devoted to BaTi1-xZrxO3 (BTZ) ceramics prepared by alternative sintering procedures from nanopowders synthesized by the modified Pechini method. The functional properties in micro and nanostructured BTZ ceramics obtained by conventional sintering (CS) and spark plasma sintering (SPS) are comparatively discussed. It was found that the decrease of grain size downward to nanoscale strongly influences the dielectric response, inducing a significant decrease of the dielectric constant, as well as the flattening of the permittivity maximum versus temperature.

As A-site homovalent dopant in BaTiO3, strontium (Sr2+) was chosen. Powders with various concentrations of solute, synthesized by the acetate route of the sol-gel method, as well as related nanocrystalline ceramics obtained by SPS were investigated. In the case of Ba1-xSrxTiO3 ceramics not only chemically-homogeneous materials, but also compositionally-graded samples were prepared by an innovative procedure in order to improve the pyroelectric properties.

Ba0.95¬Ce0.05Ti0.9875O3 (BCT) one-dimensional nanostructures were elaborated by template-mediated colloidal chemistry. The as-prepared BCT nanowires and nanoshell tubes revealed piezoelectric and ferroelectric properties. The imprint found in the "butterfly"-loop of the piezoresponse amplitude signal of 5 mol.% Ce3+-doped BaTiO3 nanoshell tubes is almost missing in the case of the nanowires with similar composition, indicating that the restrictive tubular geometry might play a key-role in generating flexoelectric effect.

The magnetic behavior of undoped and Eu-doped BiFeO3 nanopowders was intensively investigated. For this purpose, the coprecipitation via oxalate route and the sol-gel method were used. Undoped BiFeO3 (BF) nanopowders prepared through the thermolysis of a new bismuth ferrioxalate coordination compound, namely BiFe(C2O4)3·3H2O were found to also exhibit catalytic activity for doxorubicine degradation.

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