ABSTRACT BOOK

International research and practice conference:

NANOTECHNOLOGY AND NANOMATERIALS (NANO-2017)

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This book contains the abstracts of contributions presented at the International research and practice conference "Nanotechnology and Nanomaterials" (NANO-2017).

The NANO-2017 Conference was organized by the Institute of Physics of NAS of Ukraine with the participation of the Yuriy Fedkovych Chernivtsi National University (Ukraine), University of Tartu (Estonia), University of Turin (Italy), Pierre and Marie Curie University – Paris 6 (France) and Representative office of Polish Academy of Sciences in Kiev.

NANO-2017 was the fifth conference in the series of NANO-conferences initiated by the Institute of Physics of NAS of Ukraine in 2012 in the framework of FP7 Nanotwining project. From year to year, they attract more attention and participants. In 2012, the first meeting was held in the format of International Summer School for young scientists "Nanotechnology: from fundamental research to innovations". The 2013 and 2014 conferences were organized in conjunction with the International Summer Schools for young scientists under the same title. In 2013, this event was attended by more than 300 scientists, in 2014-2015, 450 scientists took part and in 2016 it gathered above 650 participants from Ukraine, Poland, Italy, Estonia, France, Austria, Germany, Greece, Turkey, USA, Romania, Moldova, Czech Republic, Taiwan, Lithuania, Egypt, Iran, India, Algeria, Indonesia and other countries. In 2017 Organizer Committee has received more than 700 application forms from about 25 countries of the world.

The NANO-2017 conference brought together leading scientists and young researchers from many countries of the world. This year its topics were as follows: Nanoobjects' microscopy; Nanocomposites and nanomaterials; Nanostructured surfaces; Nanooptics and photonics; Nanoplasmonics and surface enhanced spectroscopy; Nanochemistry and biotechnology; Nanoscale physics; Physico-chemical nanomaterials science.

This year the NANO-2017 Conference was organized in the framework of the NAS of Ukraine Program «Fundamental issues of creation of new nanomaterials and nanotechnologies» for 2015–2019.

Website of the Nano-2017 conference: http://www.iop.kiev.ua/~nano2017/

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Contribution of polarization mechanisms in colossal permittivity of doped $BaTiO_3$ ceramics

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Ferroelectrics with very large ("colossal") magnitudes of permittivity ($\varepsilon > 1000$) are demanded for modern applications: capacitance-based energy-storage and microwave devices, memory elements, etc [1]. Colossal values of the permittivity (CMP) can arise due to different phenomena, including ferroelectricity, charge-density waves, metal-dielectric interface, hopping charge transport and grains interface effects [2]. The CMP in $BaTiO_3$-based ceramics can be explained by the internal barrier layer, hopping polarization [3], and external barrier between electrode and ceramics [4].

The present work is devoted to a deeper understanding the nature of colossal permittivity of $BaTiO_3$-based ceramics and the contribution of different polarization mechanisms in the total value of permittivity.

Polycrystalline Y-doped $BaTiO_3$-based solid solutions with different amount of Mn additives were synthesized via a solid-state reaction technique. All samples were single-phased and crystallized in the tetragonal symmetry. It was experimentally established that ferroelectric semiconductors based on barium titanate had colossal values of the permittivity ($\sim 10^4$). The dielectric losses of the materials with CMP values are high enough to limit their potential applications. Impedance spectroscopy showed that the contribution of various polarization mechanisms to the permittivity decreased in the sequence: "internal barrier layer → external barrier between electrode and ceramic → hopping polarization → spontaneous ferroelectric polarization", In contrast to samples with ohmic (aluminum) contacts, samples with flap (silver) contacts had stable values of permittivity and low values of dielectric losses over a wide frequency range (up to 10^4 Hz), which is important for practical use.

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