
# ABSTRACT BOOK

**International research and practice conference:**

## NANOTECHNOLOGY AND NANOMATERIALS (NANO-2020)

**26-29 August 2020**
Lviv, Ukraine

# INTERNATIONAL RESEARCH AND PRACTICE CONFERENCE "NANOTECHNOLOGY AND NANOMATERIALS"

**(NANO-2020)**

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## Abstract book

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This book contains the abstracts of contributions presented at the International research and practice conference "Nanotechnology and Nanomaterials" (NANO-2020).

The NANO-2020 Conference was organized by the Institute of Physics of NAS of Ukraine with the participation of the University of Tartu (Estonia), the Lviv Polytechnic National University, University of Turin (Italy) and Pierre and Marie Curie University – Paris 6 (France).

NANO-2020 was the eight 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 2014-2017, 450 scientists took part and in 2018 it gathered above 650 participants. In 2019 conference was attended by more than 700 scientists 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 2019 the Organizer Committee has received more than 800 application forms from about 25 countries of the world.

The NANO-2020 conference brought together leading scientists and young researchers from many countries of the world. This year its topics were as follows: Nanobiotechnology for health-care; Nanochemistry and biotechnology; Nanocomposites and nanomaterials; Nanoobjects microscopy; Nanooptics and photonics; Nanoplasmonics and surface enhanced spectroscopy; Nanoscale physics; Nanostructured surfaces; Physico-chemical nanomaterials science.

Website of the Nano-2020 conference: http://nano-conference.iop.kiev.ua

In order to support the formation of the communications between the scientific and innovation communities the EEN-Ukraine consortium created the networking online event "Virtual NANO-2020", which was held on 26-29 August 2020 on the platform https://virtual-nano-2020.b2match.io/

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# Hausdorff analysis of magnetic flux front penetration into NbTi and the pinning structure transformation as a result of magneto-thermal effect

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The Hausdorff dimension has experienced application in the characterization and comparison of highly rough structures. It is famous that the concept of Hausdorff dimension is applied as well to magnetic flux front (induction of the magnetic field) analysis in superconductors [1]. In this report, MO registration of the magnetic flux penetration was used in the NbTi superconductor for visualization of the mechano-thermal effect on the pinning structure as key element of high critical current density. The disc shape sample was cut from a rod of NbTi after extrusion. The structure of the boundary between the Meissner and critical states was studied during external magnetic field penetration into alloy a) after the extrusion and b) after the heat treatment stages. Based on the analysis of the correlation function, it was found that: the fractal Housdorff dimension of flux front amounts to about 1.5; the fractal dimension increases a) with increasing external magnetic field and b) in fixed external magnetic field with increasing level of induction. The heat treatment stage leads to significant changes of fractal Housdorff dimension of flux front and the value of critical current density. The obtained values of roughness exponent α lie in the range of 0.435–0.480. A system with a roughness value $\alpha<0.5$ is described by a model of dynamic stochastic disorder [2], which is characteristic of the fractal nature of the structure of the magnetic flux front in a superconductor [1].

*1. V. K. Vlasko-Vlasov, U. Welp, V. Metlushko, and G. W. Crabtree. Experimental test of the self-organized criticality of vortices in superconductors // Phys. Rev. B.- 2004.-69. -P. 140504(R).*

*2. M. Kardar, G. Parisi, Y.-C. Zhang. Dynamic scaling of growing interfaces // Phys. Rev. Let. -1986.- 56.-P. 889-892.*

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