

**INTERNATIONAL RESEARCH
AND PRACTICE CONFERENCE
“NANOTECHNOLOGY
AND NANOMATERIALS”**

The NANO-2023 Conference is dedicated
to the brave men and women serving in the Armed Forces
of Ukraine, who safeguard freedom and peace in Ukraine

**16-19 of August 2023
Bukovel, UKRAINE**

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-2023).

The NANO-2023 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-2023 was the 11th conference in the series of NANO-conferences initiated by the Institute of Physics of NAS of Ukraine in 2012 in the framework of FP7 Nanotwinning 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 2021 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 2021 and 2022 the Organizer Committee has received more than 500 application forms from about 25 countries of the world each years.

The NANO-2023 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-2023 conference: <http://nano-conference.iop.kiev.ua>

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Welcome to International Conference «NANOTECHNOLOGY AND NANOMATERIALS»!

It gives me a great pleasure to welcome you all at the International Conference “Nanotechnology and nanomaterials” (NANO-2023) that will be held in Lviv from August 16 to 19, 2023. Its aim is to promote scientific contacts and discussions between researchers representing various fields.

Previous NANO Conferences, held in Ukraine in 2013-2022, allowed the participants, including young scientists, to familiarize with current research and application problems in this area and thus forward implementation of nanotechnologies into innovations meeting public needs. The events also gave the opportunity to young and early-career researchers to attend lectures of internationally recognized experts and roundtable discussions on the emerging fields in nanosciences and nanotechnologies.

Our previous International Conferences and Summer Schools received positive feedback from international experts and from the media. Now we are holding the 11th such meeting, for which we are deeply grateful to its indefatigable initiator and organizer, Dr. Olena Fesenko and all her assistants, as well as to the universities and institutes that hospitably welcome the participants.

This year above 600 registration forms have been received from scientists representing more than 30 countries. We especially appreciate the participation in the conference of our foreign colleagues, both those who attend here and those who communicate their works remotely.

The fruitful cooperation of scientists is highly important not only to science itself. It helps us to overcome political and war conflicts and misunderstandings and to find our just peaceful future, which is now vitally important not only to Ukraine but also to other countries.

I wish the participants of the Conference to successfully share and broaden their knowledge in nanoscience and nanotechnologies, to advance the networking and launch new contacts between academia and research players in this area and thus to create a good basis for further practical contributions.

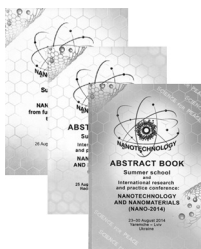
May good health serve us and promote creative success in our research!

Academician of NAS of Ukraine,
Professor



Anton G. Naumovets

Our publications



Abstracts Book of the 1st International Summer School (2012)
Abstracts Book of the 1st International Summer School and International Conference NANO 2013
Abstracts Book of the 2nd International Summer School and International Conference NANO 2014
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Abstracts Book of the 6th International Conference NANO-2018



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O. Fesenko, L. Yatsenko (eds.), Nanocomposites, Nanophotonics, Nanobiotechnology, and Applications, Springer Proceedings in Physics 156, DOI: 10.1007/978-3-319-0661-0, ©Springer International Publishing, Switzerland 2014
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Participants of International Summer Schools and International NANO Conferences - published their articles in Special Issue of Springer Open Journal “Nanoscale Research Letters” (in 2013, 2014 and 2015) dedicated to NANO Conferences. Impact Factor of Journal - 2.779.

In 2016-2018 it was also possible to publish an articles for participants of the NANO conference in Applied Nanoscience Journal, The European Physical Journal Plus (EPJ Plus) and Applied Sciences Journal (SN).

www.springer.com/materials/nanotechnology/journal/11671

Also, since 2017 year it was possible to publish the articles for participants of NANO Conference in the Molecular Crystals and Liquid Crystals Journal

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The Enterprise Europe Network (EEN) is a service that provides support for Small and Medium-sized Enterprises (SMEs) with international ambitions. Co-funded by the European Union's COSME and Horizon 2020 programmes, the Network's aim is to

help businesses innovate and grow internationally.

The Enterprise Europe Network was launched on 7 February 2008 by former EU Commissioner Günter Verheugen. The Enterprise Europe Network combines the previous Euro Info Centres and the Innovation Relay Centres. From 2008 to 2014, the Network was co-financed by the EU's Competitiveness and Innovation Framework Programme (CIP), in cooperation with institutions at national and regional levels. From 2015-2020, the Network is co-financed under the European Union's programme for the competitiveness of SMEs (COSME) and Horizon 2020.

Under the responsibility of the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, the Enterprise Europe Network is managed by the Executive Agency for Small and Medium-sized Enterprises (EASME).

The Network is active in more than 70 countries worldwide. It brings together 6,000 experts from more than 600 member organisations, including:

- chambers of commerce and industry
- technology poles
- innovation support organisations
- universities and research institutes
- regional development organisations

Enterprise Europe Network innovation support services are available based on an assessment of the needs and development phase of the business.

At an entry level, Network services include:

- information on innovation-related policies, legislation and support programmes
- links with local innovation stakeholders
- information about access to local sources of funding/support

Network experts can provide one-to-one services to support innovation capacity building. Services include innovation audits, advice on intellectual property, marketing and access to finance.

Finally, the Network provides key account management services to businesses benefitting from the Horizon 2020 SME instrument programme, part of the European Innovation Council (EIC) pilot.

In 2017, Ukraine joined the European Enterprise Network (EEN) within the framework of the COSME program, which promotes the competitiveness and innovative development of SMEs, innovation organizations and institutes/universities. For this purpose in Ukraine was created a Consortium EEN-Ukraine, which included representatives of business and government agencies, as well as scientific organizations. The Partner of the EEN-Ukraine Consortium is Institute of Physics of NAS of Ukraine.

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Influence of deformation force during vibration-centrifugal hardening on properties of nanocrystalline structure of steel 40Kh

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Vibration-centrifugal hardening (VCH) is one of the methods for forming a surface nanostructure by severe plastic deformation, which increases wear resistance [1] of the working surfaces of machine parts. The essence of VCH is that the tool with protruding balls fixed in it moves along the outer or inner cylindrical surface, which vibrates with a certain amplitude and frequency, creating shock dynamic loads (SDL) [1]. These SDL are characterized by the force of impact between the tool and the part, which is determined by the relationship [2]:

$$P - m\varepsilon\omega^2,$$

where m is the tool weight; ε is the tool eccentricity; ω is the circular frequency of part vibrations.

VCH creates an impact force from $P = 477$ N with a weight of the tool $m = 3.5$ kg, its eccentricity $\varepsilon = 0.006$ m to $P = 2045$ N with $m = 7.5$ kg, $\varepsilon = 0.012$ m for a ball diameter of 0.0135 m. This provides microhardness and hardened surface depth ranging from 3.4 GPa and 2.3 mm to 4.9 GPa and 6.2 mm. However, the optimal impact force is $P = 1022$ N, which allows you to get a maximum microhardness of 8.9 GPa and a strengthening depth of 5.8 mm on steel 40Kh.

The deformation force forms a high microhardness of the surface layer obtained due to high fragmentation of the structure up to 18 nm under the optimal treatment mode. The influence of the deformation force during VCH on the wear resistance of steel 40Kh, which increases to 2.8 times, has been established.

1. Kyryliv V., Kyryliv Y., Sas N. Formation of surface ultrafine grain structure and their physical and mechanical characteristics using vibration-centrifugal hardening // Adv Mater Sci Eng.-2018.-3152170.-7 p.

2. I. S. Aftanaziv, A. P. Gavrysh, P. O. Kyrychok, et al., Improvement of the Reliability of Machine Parts by Plastic Surface Straining. A Textbook [in Ukrainian], ZhITI, Zhytomyr (2001).

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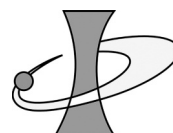
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