

**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

УДК 536:669

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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



Group photo of participants of the 1st International Summer School for young scientists "NANOTECHNOLOGY: from fundamental research to innovations" (Bukovel 2012)



Interview with Prof. Dr. Thomas A. Klar, Director of the Institute of Applied Physics, Johannes Kepler University of Linz, Austria



At the lecture during the 1st International Summer School



Summer school participants on the background of the monument, which is a symbol of the geographical center of Europe (Rakhiv district)



Closing ceremony of the 1st International Summer School for young scientists "NANOTECHNOLOGY: from fundamental research to innovations"



Group photo of the 2nd International Summer School participants
(Bukovel 2013)



Summer School participant
PhD. Vorokhta M. (Czech Republic)
tries to play trembita



Plenary Session



The organizing committee
working hard



PhD. Lyashchova A.G.
(Ukraine)



Group photo of 1st International NANO-2013 Conference participants (Bukovel 2013)



Opening speech by Dr. habil. Emmanuelle Lacaze (France)



Online presentation of the Springer book with selected proceedings of the 1st International Summer School



Head of the Local organizing committee Dr. O.Fesenko



Excursion to the city of Lviv



Group photo of 3rd International Summer School participants (Yaremche 2014)



Discussion with speaker



Hiking the path of Dovbush, Carpathians



Director of Institute of Physics of NAS of Ukraine Prof. Leonid Yatsenko awards prizes to the winners of competition



Interview with Prof. Leonid Chernozatonskiy from Prokhorov Institute of general physics (Russia)



Group photo of the 3rd International NANO-2014
Conference participants (Lviv, 2014)



Choir of Lviv National
Ivan Franko University performs the
national anthem of Ukraine



Opening speech of Rector of Ivan
Franko National University of Lviv,
Prof. Volodymyr Melnyk



Report of Prof. Francesco Bonaccorso,
leading specialist in graphene
investigations



Scientific discussion
with the audience



Group photo of the 3rd International NANO-2015 Conference participants (Lviv 2015)



Scientific discussion with the audience



Report of Prof. Dr. Thomas A. Klar, Director of the Institute of Applied Physics, Johannes Kepler University of Linz, Austria



Ivan Franko National University of Lviv violin ensemble performs



"Cheremosh" folk song and dance ensemble during the Conference opening ceremony



Group photo of the 4th International NANO-2016
Conference participants (Lviv 2016)



Scientific discussion with the
audience



Report of Prof. Dr S. S. Choi
(South Korea)



Registration of participants



Excursion to the Museum of Folk
Culture and Rural Life in Lviv



Group photo of 5th International Summer School participants
(Bukovel 2017)



Scientific reporting



Report of Prof. Dr Stefano Bellucci



Tourist complex Mygovo



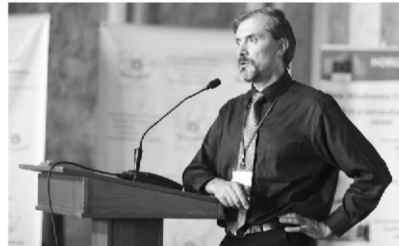
Don't forget for dinner barbeque



Group photo of the 5th International NANO-2017 Conference participants (Chernivtsi 2017)



Report of heads of conference



Report of Prof. Dr. Vadym Mochalin (USA)



Registration of participants



Symphonic orchestra of Chernivtsi



Group photo of the 6th International NANO-2018
Conference participants (Kyiv 2018)



Registration of participants



Report of Dr. Hanna Morozovska
(Ukraine)



Discussion during the poster session



Organizing committee
of NANO-2018



Presentation of Philippe Mariani, CEO of Sophia Antipolis Foundation



Interview for a media



Experts in innovative ecosystem



Discussion with the audience



Expert committee chooses the best startups



Presentation of Philippe Mariani, CEO of Sophia Antipolis Foundation



Registration of the participants



Report of Prof. Andzey Suchocki
(Austria)



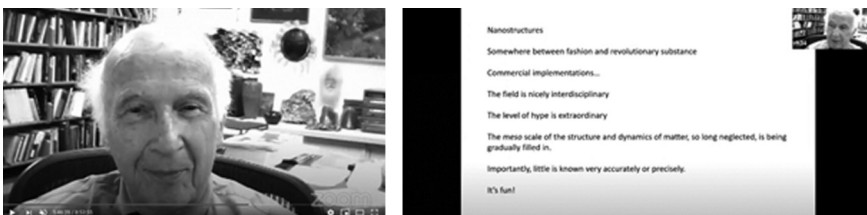
Mr. Jastin Taruska, member of the
Innovation start-ups competition jury



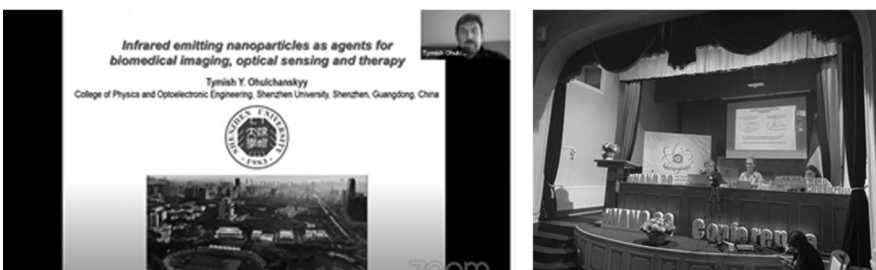
Awarding the winners of the
Innovation start-up competition



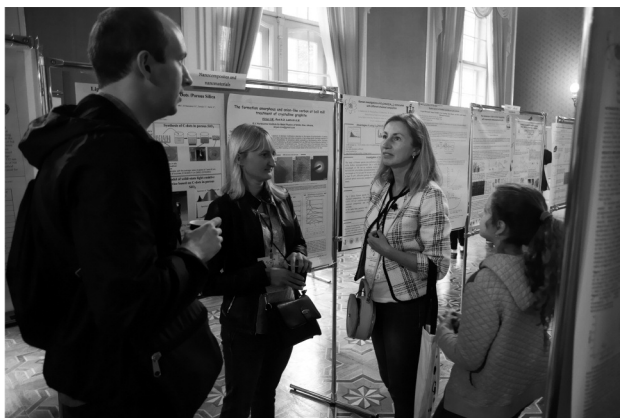
A collective photo of the participants of the NANO-2020 conference on the stairs of the Lviv House of Scientists



Online speech by Nobel laureate Roald Goffman



Online and offline speech by Prof. Tymish Y. Ohulchansky and Dr. Sergey Kolotilov respectively



A participant of the NANO-2021 conference presents his poster to colleagues



Participant of the NANO-2021 conference presents his oral report



General photo of NANO-2021 conference participants after all official events



General photo of NANO-2022 conference participants after all official events



A participant of the NANO-2022 conference presents her poster



Organizing committee of NANO-2022



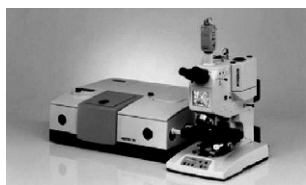
Participant of the NANO-2022 conference presents his oral report

INTERNATIONAL LABORATORY “SURFACE ENHANCED SPECTROSCOPY”

The International “Surface enhanced spectroscopy (SES)” laboratory was created at the International Research and Innovation Cooperation, Technology Transfer Department of the Institute of Physics NAS of Ukraine in the framework of implementation of Nanotwinning Project. This laboratory has a close cooperation with its Partners: Institute of Physics of the University of Tartu (Estonia), Pierre and Marie Curie University (France) and University of Turin (Italy).

Main activity: Study of mechanisms and effects of the enhancement of optical signals from bioorganic molecules near metal and non-metal (carbon, graphene) surfaces using IR and Raman spectroscopy, creation of a new type of substrates for spectroscopy, applications of Surface enhanced Infrared absorption (SEIRA) and Surface enhanced Raman scattering (SERS) spectroscopy.

Equipments: FTIR Spectrometer VERTEX 70 equipped with FTIR microscope HYPERION 1000 (Bruker, Germany), inVia micro-Raman spectrometer (Renishaw, England), UV-260 spectrophotometer (Shimadzu, Japan) with diffuse reflectance attachment and all needed equipment for sample preparation.



*FTIR Spectrometer VERTEX
70 (Bruker, Germany)*



*InVia micro-Raman spectrometer
with lasers $\lambda = 786$ and 633 nm
(Renishaw, England)*

The International Laboratory Team has many years' experience in preparation, implementation and management of International Projects.

Laboratory's Projects:

- STCU Project “Rose”;
- FP7-PEOPLE-2013-IRSES, Marie Curie actions;
- FP7 Nanotwinning project No 294952;
- NATO “Science for Peace” Project NUKR.SFPP.984702;
- Horizon2020_COS-EEN Project for 2016–2020 years.

We are interested in cooperation in the field of development of scientific and infrastructural International projects in the frame of Horizon2020 and others Programs.

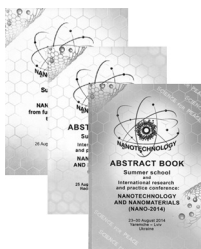
Head of Laboratory

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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
Abstracts Book of the 3rd International Conference NANO-2015
Abstracts Book of the 4th International Conference NANO-2016
Abstracts Book of the 5th International Conference NANO-2017
Abstracts Book of the 6th International Conference NANO-2018



O. Fesenko, L. Yatsenko and M. Brodin et al. (eds.), *Nanomaterials, Imaging techniques, Surface Studies, and Applications*, Springer Proceedings in Physics 146, DOI: 10.1007/978-1-4614-7675-7, ©Springer Science+Business, Media, New York 2013
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
O. Fesenko, L. Yatsenko, *Nanoplasmonics, Nano-Optics, Nanocomposites, and Surface Studies* 167, DOI: 10.1007/978-3-319-18543-9, ©Springer International Publishing, Switzerland 2015
O. Fesenko, L. Yatsenko, *Nanophysics, Nanophotonics, Surface Studies, and Applications* 183, DOI: 10.1007/978-3-319-30737-4, ©Springer International Publishing, Switzerland 2016
O. Fesenko, L. Yatsenko, *Nanocomposites, Nanostructures, and Their Applications* 221, DOI: 10.1007/978-3-030-17759-1, ©Springer International Publishing, Switzerland 2019
O. Fesenko, L. Yatsenko, *Nanophotonics, Nanooptics, Nanobiotechnology, and Their Applications* 222, DOI: 10.1007/978-3-030-17755-3, ©Springer International Publishing, Switzerland 2019



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

<https://www.tandfonline.com>

Our Partners:



The Enterprise Europe Network helps businesses innovate and grow on an international scale. EEN-Ukraine Consortium can help you to find investors, international partner and promote your innovation products. Our contacts:

Website of Consortium: <http://www.iop.kiev.ua/~een/>

E-mail: een.network.ukraine@gmail.com



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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.

To contact EEN-Ukraine please follow the website

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Green synthesis of cobalt ferrites using different types of plant extracts

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Materials with a spinel structure have long been of interest because they can be used as magnetic materials, pigments, catalysts, and refractories. They can exhibit different properties depending on the synthesis method. Various methods can be used for the synthesis of spinel nanoparticles with a large surface area, such as sol-gel, co-precipitation, hydrothermal, combustion, microemulsion, sonochemical method, etc. In this research, we have used the method of green chemistry for cobalt ferrite obtaining. Green chemistry is a technique applied for nanoparticles synthesis and involves using of plant extract as an effective reducing and chelating agent. This paper describes the synthesis of cobalt using different types of plant extracts as an effective reducing agent. In particular, the extracts from follow plants were used: Gingko Biloba leaves, Physalis fruits, and Rosa canina fruits. The powders were characterized by XRD, SEM, EDS, and IR spectroscopy. Crystallite sizes of the samples are obtained by Scherer and Williamson-Hall methods and were found around 10 nm. The spinel structure of magnetic nanoparticles has been confirmed by XRD and IR spectroscopy. The tetrahedral and octahedral structure is confirmed by two corresponding peaks in the IR spectra, and few peaks in the range 1300-3700 cm^{-1} that show surface functionalization of magnetic nanoparticles. SEM and EDS proved the surface morphology and elemental composition respectively. Nanoparticles of CoFe_2O_4 obtained by an environmentally friendly method can be used as a magnetic adsorbent for water purification.

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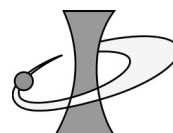
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