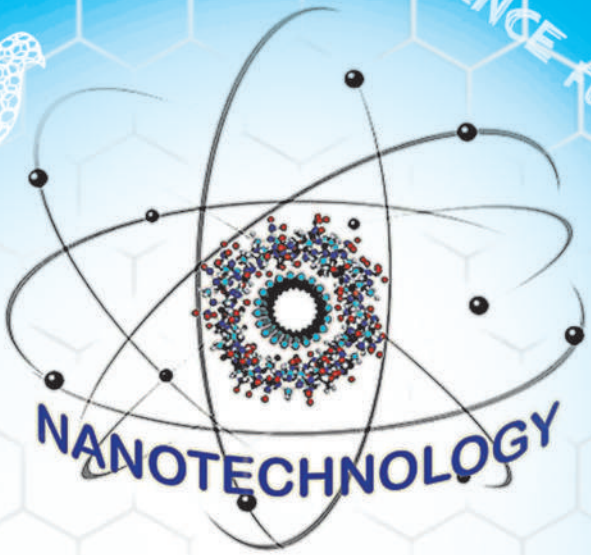

ABSTRACT BOOK

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)

26-29 August 2020

Lviv, UKRAINE

Abstract book

УДК 536:669

The International research and practice conference "Nanotechnology and nanomaterials" (NANO-2020). Abstract Book of participants of the International research and practice conference, 26 – 29 August 2020, Lviv. Edited by Dr. Olena Fesenko. – Kyiv: LLC «Computer-publishing, information center», 2020. – P. 552.

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/

ISBN: 978-966-97587-3-6

Resistance of surface nanocrystalline and ultrafine-grained structures to wear and cavitation erosion damage

***Kyryliv Y. B.*[1], Kyryliv V. I.[2], Tsizh B. R.[3,4], Maksymiv O. V.[2]**

[1]*Lviv State University of Life Safety, 35 Kleparivska St., Lviv 79007, Ukraine*
E-mail: yaroslav_kyryliv@ukr.net

[2]*Karpenko Physical-Mechanical Institute of the NAS of Ukraine,*
5 Naukova St., Lviv 79060, Ukraine

[3]*Kazimierz Wielki University in Bydgoszcz,*
30 Chodkiewicza St., Bydgoszcz 85064, Poland,
[4] *Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies Lviv, 50 Pekarska St., Lviv 79010, Ukraine*

One of the effective methods for the formation of surface nano- and ultrafine-grained structures is severe plastic deformation. Among them are mechanical pulse treatment (MPT) and vibration-centrifugal hardening (VCH). During MPT [1], the fragmentation of the structure occurs due to the use of high-speed friction energy of the treated surface and a special metal hardening tool. A nanocrystalline structure is formed with a high microhardness up to 8-12 GPa and regulated by processing modes with a depth of up to 500 microns. The VCH [2] compares favorably with the existing methods of vibration processing by the design of a special cylindrical reinforcing tool with balls fixed in it around the perimeter. Such conditions increase contact stresses in the contact zone, deform and fragment the grain structure with high microhardness (7-9 GPa) and increased depth of the hardened layer to 5-6 mm. This makes it possible to carry out additional finishing operations for finishing high precision surfaces. Both techniques form residual compressive stresses in the surface layers. It was shown that nano- and ultrafine grain surface structures have a reduced friction coefficient, which is obviously due to a change in the electronic configuration caused by high compression stresses in the grains. The influence of treatments on the wear resistance in an oil, oil-abrasive medium and the resistance to cavitation erosion damage is investigated. Their advantages are shown in comparison with traditional methods of heat treatment.

1. V. I. Kyryliv, "Surface saturation of steels with carbon during mechanical-pulse treatment," Materials Science, vol. 35, no. 6, pp. 853–858, 1999.

2. V. Kyryliv, Y. Kyryliv, N. Sas, and V. Dutka "Residual stresses formed by vibration-centrifugal hardening," Advances in Materials Science and Engineering, vol. 2020, Article ID 5189473, 7 pages, 2020.

Autor Index

L

Content

Co-organizers of conference:

Institute of Physics of the NAS of Ukraine, Ukraine;
Lviv Polytechnic National University;
University of Turin, Italy;
Pierre and Marie Curie University and CNRS, France;
University of Tartu, Estonia;
Representative office of Polish Academy of Sciences in Kiev;
EEN-Ukraine Consortium.

Partners of Conference

Springer
Taylor & Francis Group, LLC

Organizing Committee Members of conference:

Chairman: NASU academician A.G. Naumovets, Vice-President of the NAS of Ukraine;
Vice-Chairman: NASU academician L.P Yatsenko, Director of Institute of Physics of the NAS of Ukraine;
NASU corresponding member A.V. Ragulia, Problems of Material Sciences Institute, NAS of Ukraine;
NASU corresponding member V.N. Uvarov, Metallophysics Institute, NAS of Ukraine;
NASU academician M.S. Brodyn, Institute of Physics, NAS of Ukraine;
NASU corresponding member A.M. Negriyko, Institute of Physics, NAS of Ukraine;
Petro Fochuk Yuriy Fedkovych Chernivtsi National University, Ukraine;
Yuriy Khalavka Yuriy Fedkovych Chernivtsi National University, Ukraine;
Victor Martynyuk, Taras Shevchenko national University of Kyiv;
Oleksandr Bediukh, Taras Shevchenko national University of Kyiv.

International Committee:

Prof. Henryk Sobczuk, Representative office „Polish Academy of Sciences" in Kyiv;
Prof. Gianmario Martra, University of Turin, Italy;
Prof. Dr. habil. Emmanuelle Lacaze, Pierre and Marie Curie University and CNRS, France;
Prof. Bouchta Sahraoui, University of Angers, UFR Sciences, Institute of Sciences and Molecular Technologies of Angers, France;
Prof. Bakolas Dimitris, European Profiles A.E., Greece;
Dr. L.A. Dolgov, University of Tartu, Estonia;

Prof. Mohamed Bououdina, University of Bahrain, Kingdom of Bahrain;
Prof. Dr. Annemarie Pucci, Kirchhoff Institute of Physics of the Ruprecht-Karls University of Heidelberg, Germany.

Local Organizing Committee of the Lviv Polytechnic National University

Sc.D., Prof. P.I. Kalenyuk, director of Institute of Applied Mathematics and Fundamental Sciences;
Sc.D., Prof. I.N. Prudyus, director of Institute of Telecommunications, Radioelectronics and Electronic Engineering;
Sc.D., Prof. I.I. Grigorchak Institute of Applied Mathematics and Fundamental Sciences;
Sc.D., Prof. B.A. Lukiyanets, Institute of Applied Mathematics and Fundamental Sciences;
Sc.D., Prof. M.Z. Mikityuk, Institute of Telecommunications, Radioelectronics and Electronic Engineering;
Sc.D., Prof. I.P. Ostrovsky, Institute of Telecommunications, Radioelectronics and Electronic Engineering;
Sc.D., Prof. V.M. Fitio, Institute of Telecommunications, Radioelectronics and Electronic Engineering;
Ass.Prof. I.Ya. Yaremchuk, Institute of Telecommunications, Radioelectronics and Electronic Engineering;
Sc.D, Prof. G.A. Ilchuk, Institute of Applied Mathematics and Fundamental Sciences;
Sc.D., Prof. P.P. Kostrobii, Institute of Applied Mathematics and Fundamental Sciences

Chairman of Local Committee and Secretary of Conference:

Dr. O.M. Fesenko, Institute of Physics of the NAS of Ukraine.

Local Committee:

Dr. O. Budnyk, Mr. Y. Kifiuk, Mr. A. Yaremkevich, Mrs. N. Skichko, Mrs. T. Tsebrienko, Mr. P. Golub, Mrs. A. Klochek, Mrs. N. Davydenko

Наукове видання

The International research and practice conference "Nanotechnology and nanomaterials" (NANO-2020)

Book of abstracts is published in authors' edition without modifying by the Organizing Committee

Head of Organizing Committee:
Dr. *Olena Fesenko*, Institute of Physics of the NAS of Ukraine Design and layout: *Volodymyr Havlo*

Technical support in the course of the International conference (NANO-2020). Junior Researchers of the Institute of Physics of the NAS of Ukraine A.D. Yaremkevych (media assistance) and Y.S. Kifiuk (sound equipment and photo report), Leading Engineers of the Institute of Physics of the NAS of Ukraine N.V. Skichko (informational and transportation support), O.P. Budnyk (registration of participants and excursions), A.V. Klochek (registration of participants and general questions), T.V. Tsebrienko (registration support), N.V. Davydenko (general questions), P. Golub (Technical support).

Здано в набір 24.07.2020. Підписано до друку 11.08.2020.
Формат 60x90/$_{16}$. Папір офсетний. Умовн. друк. арк.34,5. Зам. № 262.

Publishing House - LLC «Computer-publishing, information center», Kiev, Ukraine

Virtual NANO event – In 2020 the NANO Conference was combined with a virtual platform for b2b and s2b communication for promotion international Research and Business Partnerships. The networking matchmaking event Virtual NANO-2020 was organized by the Enterprise Europe Network - Ukraine Consortium. Virtual NANO-2020 brings together researchers, scientists, engineers, business, technical and policy professionals to promote research and industrial collaborations, identify priorities, and strengthen the innovation ecosystem.

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 2-nd International Summer School and International Conference NANO-2014
Abstracts Book of the 3-rd International Conference NANO-2015
Abstracts Book of the 4-th International Conference NANO-2016
Abstracts Book of the 5-th International Conference NANO-2017
Abstracts Book of the 6-th International Conference NANO-2018
Abstracts Book of the 7-th International Conference NANO-2019

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

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.

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

Our Partners:

The Enterprise Europe Network is the world's largest support network 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 representative EEN in Ukraine - EEN-Ukraine Consortium.

www.ec.europa.eu

Springer Science+Business Media or Springer is a global publishing company that publishes books, e-books and peer-reviewed journals in science, technical and medical publishing.

www.springer.com

Taylor & Francis Group is an international company that publishes books for all levels of academic study and professional development, across a wide range of subjects and disciplines and quality peer-reviewed journals under the Routledge and Taylor & Francis imprints.

www.taylorandfrancis.com

"Polska Akademia Nauk" w Kijowie.

- Wspólne konferencje w różnych dziedzinach nauki
- Wspólne publikacje naukowców polskich i ukraińskich w ważnych czasopismach
- Wspólne opracowania, patenty, wdrożenia
- Udział w projektach transgranicznych z częścią naukową z różnych dziedzin nauki