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The NANO-2024 Conference was organized by the Institute of Physics of NAS of Ukraine with the participation of the University of Tartu (Estonia), the Uzhhorod National University, University of Turin (Italy) and Pierre and Marie Curie University – Paris 6 (France).

NANO-2024 is the 12th 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 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, India, Algeria, Indonesia and other countries. In 2021 - 2023 the Organizer Committee has received more than 800 application forms from about 25 countries of the world each years.

The NANO-2024 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.

This year, the conference is organized with the support of the project "Knowhow Communities for Accelerating RTI Transfer in the Danube Region" (RTIT>>), DRP0200330.

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Formation of nanostructures by vibration-centrifugal hardening under various processing modes on 40Kh steel

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The influence of surface layer processing modes during vibration-centrifugal hardening [1] on changes in the structure, microhardness and wear resistance of 40Kh steel has been studied. The deformation forces were regulated by changing the mass of the strengthening tool and eccentricity. It has been established that the initial ferrite-pearlite structure is transformed into a ferrite nanostructure during the decomposition of cementite. Changing processing modes affects the grain size, dislocation density and microhardness of the strengthened surface layer [2]. So, with masses m = 3.5, 4.5, 7.5 kg, the grain sizes are respectively L = 28, 19, 43 nm. This change in structure as a result of vibration-centrifugal hardening increases the wear resistance of the friction pair of both the ring and the insert compared to hardening by reducing the friction coefficient of the pair [3] and the temperature in the contact zone of the friction pair. With grain sizes L = 28, 19, 43 nm, the friction couple coefficient of steel 40Kh – steel 40Kh is f = 0.10, 0.07, 0.08, and the temperature in the contact zone is T = 68, 50, 57ºC, respectively. It has been shown that under optimal processing conditions, the wear resistance of friction pairs in an oil environment increases by 1.72 and 2.5 times, respectively, compared to hardened samples due to a decrease in the friction coefficient. This is explained by the electronic configuration of the surface of the nanostructure.

1. Kyryliv Y., Kyryliv V., Sas N., Dutka V. Residual Stresses Formed by Vibration-Centrifugal Hardening // Adv Mater Sci Eng, - 2020. – 5189473. - 7 p.

2. 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.

3. Kyryliv Y., Kyryliv V., Tsizh B. and Maksymiv O. Resistance of surface nanostructures and ultrafine grain structures on steel 40Kh to wear and cavitation-erosive destruction // Appl Nanosci 12, 1085–1090 (2022).

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