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NANOBIOPHYSICS: Fundamental and Applied Aspects NBP-2025

BOOK OF ABSTRACTS

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9th International Conference
NANOBIOPHYSICS: Fundamental and Applied Aspects

Organized by: B. Verkin Institute for Low Temperature Physics and Engineering
of the National Academy of Science of Ukraine

6-9 October 2025, Kharkiv. Ukraine

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This book contains 86 peer-reviewed abstracts of reports presented at the 9th International Conference NANOBIOPHYSICS: Fundamental and Applied Aspects 2025. The materials represent current results of multidisciplinary studies in the field of nanobiophysics, including data on nanobiohybrids formed by 1-D or 2-D nanomaterials with biomolecules, properties of biomolecules on nanoparticles and nanostructured surfaces, physical properties of biomolecular nanosystems, theoretical calculations and computer modeling of nanobiosystems, and various applied aspects of nanobiophysics. Also abstracts of the talks given within the framework of the NanoBioPhysics-2025 round table "History of Biophysics in Kharkiv" are presented.

A collection of the accepted conference manuscripts will be published in the special issues of “Biophysical Bulletin” and “Low Temperature Physics” journals as the conference proceeding.

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PREAMBLE

Dear Participants of the NBP-2025 Conference,

It is our great pleasure to welcome you to the 9th International Conference **"NANOBIOPHYSICS: Fundamental and Applied Aspects"** (NBP-2025) which will be held from October 6 to 9, 2025 in Kharkiv, Ukraine at the B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine.

"NanoBioPhysics" conference series was jointly launched in 2009 by the B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine and the Institute of Physics of the National Academy of Sciences of Ukraine. Previous eight conferences were organized biennially in Kyiv and Kharkiv alternately.

The aim of our conferences is to enlighten urgent problems in a modern scientific field combining biophysics and nanotechnology, to evaluate its progress and advances, and to discuss prospects of its further development. These topical issues will be debated at the NBP-2025 during the following sessions:

1. Nanobiohybrids of 1-D or 2-D nanomaterials with biomolecules
2. Biomolecules on nanoparticles and nanostructured surfaces
3. Physical properties of biomolecular nanosystems
4. Theoretical calculations and computer modeling of nanobiosystems
5. Applied aspects of nanobiophysics
6. Round table "History of Biophysics in Kharkiv"

It is expected that the NBP-2025 conference will provide opportunities to share up-to-date information obtained in the fields of biophysics and nanosciences, to exchange new ideas, and to tighten existing or to gain new collaboration. A special attention will be devoted to problems of professional promotion of young researchers. The conference will bring together colleagues from the international scientific community.

We wish the conference participants fruitful work, high-quality scientific presentations, and long-awaited meeting with the colleagues.

Organizing Committee
of the 9th International Conference
"NANOBIOPHYSICS:
Fundamental and Applied Aspects"

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INHIBITION OF *PSEUDOMONAS AERUGINOSA* GROWTH BY "GREEN" SYNTHESIZED SILVER NANOPARTICLES

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The development of nanotechnology attracts now special attention due to the wide range of applications of nanomaterials in technology, medicine, and agriculture. So-called "green" synthesis, which involves the use of extracts from living organisms, in particular, plants, to obtain metal nanoparticles (NPs) is one of the practically used methods. The method is environmentally friendly because it does not require toxic chemicals. The shape and size of NPs depend on the type of plant extract, reaction temperature, pH of the medium, and precursor concentration. Phytochemical compounds contained in plant extracts can stabilize nanoparticles, preventing their aggregation. The NPs have high surface activity, which contributes to their biological effectiveness. They can interact with the cell membrane of microorganisms, causing its damage and dysfunction.

In this work, we investigated the antimicrobial activity of silver nanoparticles obtained by "green" synthesis using an extract from biotechnological roots of *Bidens pilosa* plants.

The presence of antibacterial properties in the nanoparticle samples was checked using the test strain *Pseudomonas aeruginosa* UCM B-907 (ATCC 27853 (F-51) from the Ukrainian Collection of Microorganisms (UCM, D.K. Zabolotny Institute of Microbiology and Virology of the National Academy of Sciences of Ukraine) which is recommended by the State Pharmacopoeia of Ukraine for controlling the accuracy of determining susceptibility to antibiotics. Cultivation of microorganisms was carried out on Mueller-Hinton agar - MXa (Conda) at the temperature of 37°C for 18-24 h, which is a requirement of EUCAST for the methodology of conducting microbiological studies of the sensitivity of microorganisms to antimicrobial drugs. Using serial tenfold dilutions, suspensions with a titer of $2\text{-}5\times10^5$ CFU/ml were obtained, which were used in further studies. Incubation was performed in 24-well culture plates. When determining the bactericidal activity, 50 µl of nanoparticle sample was added to individual wells of the plates and 450 µl of a suspension of bacteria with a titer of $2\text{-}5\times10^5$ CFU/ml was added. As a positive control, 450 µl of a similar suspension of the test strain of microorganisms with the addition of 50 µl of sterile saline solution was used. Cultivation was carried out at 37°C for 18-24 h, after which the titer of the bacteria was determined.

The results of the study showed that after 18-24 h of contact of nanoparticles in dilutions of 1:10, 1:100 and 1:1000 with *P. aeruginosa* UCM B-907 in the studied suspension with a volume of 100 µl, no viable bacteria were detected. When nanoparticles in a dilution of 1:10000 interacted with indicated microorganisms, the final titer of bacteria was 5.1×10^4 CFU/ml. The quantity of *P. aeruginosa* UCM B-907 in the control sample without the addition of nanoparticles after 18-24 h of incubation was 5.3×10^6 CFU/ml. Considering the given indicators of the titers of microorganisms in the experimental and control samples and the dilution factor, it can be stated that the nanoparticles reduced the number of *P. aeruginosa* UCM B-907 cells by 1039215 times.

Thus, it was found that nanoparticles derived from biotechnological roots do indeed have a high level of antimicrobial activity against test strain *P. aeruginosa* UCM B-907.