EDITORIAL

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6th INTERNATIONAL CONFERENCE "NANOBIOPHYSICS: FUNDAMENTAL AND APPLIED ASPECTS"

6th International Conference "NANOBIOPHYSICS: Fundamental and Applied Aspects" – NBP-2019 took place on October 1–4, 2019 in Kyiv, Ukraine, at the Institute of Physics of the National Academy of Sciences of Ukraine.

"NanoBioPhysics" conference series was jointly launched in 2009 by 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 five conferences were organized on biennial basis in Kyiv and Kharkiv alternatively.

The NBP-2019 conference brought together the scientists working in the fields of nanoscience, nanotechnologies and molecular biophysics and dealing with the biological macromolecules or/and their complexes with any kind of nanoparticles or nanostructured media. The goal of the conference was to discuss recent achievements and to push forward this innovative area of science and technology.

In the conference 63 scientists arrived from 14 countries (Photo 1), they made 36 lectures, including 17 invited speakers, and 27 poster presentations. Book of abstract with 107 pages was published [1]. The lectures were delivered by famous scientists from Ukraine, Belarus, Italy, France, Latvia, Lithuania, Estonia, Germany, Poland, Czech Republic, Canada, Denmark, USA and Egypt.

Photo 1. Participants of the 6th International Conference "NANOBIOPHYSICS: Fundamental and Applied Aspects", the Institute of Physics of 2019, Kyiv, Ukraine.

The latest achievements and advances in both academic and commercial aspects of NanoBioPhysics were enlightened in the following sessions:

- Physical properties of biomolecular nanosystems;
- Interactions of biomolecules with nanoparticles and nanostructured surfaces;
- Enhancement of optical processes in biomolecules by nanostructured metal surfaces;
- Biomolecules, hybrids of biomolecules with carbon nanostructures (graphene, nanotubes, fullerenes, and other carbon nanoparticles);
- Theory and computer modeling of nanoscopic biological systems;
- BioNano-materials, -composites and their applications.

Urgent subjects of nonobiophysical research were covered in the plenary invited lectures. In the framework of the subject of experimental investigations and computer modeling of physical properties of biomolecular nanosystems Professor ***Rinken A.*** (*Tartu, Estonia*) reported about characterization of single molecule interactions between proteins and their ligands using total internal reflection fluorescence (TIRF) microscopy; Professor ***Kryachko E.S.*** (*Kyiv, Ukraine*) discoursed the retrospective of exploration of point tautomeric mutations in the base pairs of DNA.

A number of lectures enlightened achievements in scrutinizing of interaction of biomolecules with carbon nanostructures and nanoparticles and their promising applications. Professor ***Demchenko A.P.*** (*Kyiv, Ukraine*) surveyed application of fluorescent carbonic nanoparticles (C-dots) as efficient instruments in molecular and cellular research. Professor ***Strek W.*** (*Wrocław, Poland*) told about laser stimulated lighting of graphene materials. Professor ***Karachevtsev V.A.*** (*Kharkiv, Ukraine*) delivered a talk about photoluminescence from single-walled carbon nanotubes for biosensing and biomedical applications. Dr. ***Biloivan O.A.*** (*Kyiv, Ukraine*) described utilization of carbon nanomaterials in design of electrochemical biosensors. Dr. ***Stepanian S.G.*** (*Kharkiv, Ukraine*) reported on computational study of MoS_2 complexes with nucleic acid bases.

Phenomena that accompany interactions of biomolecules with nanostructured surfaces and nanoparticles formed the basis for so called surface-enhanced techniques. Professor ***Bandarenka H.*** (*Minsk, Belarus*) compared the results of macromolecules analysis using metallic nanoparticles and nanovoids by exploiting surface enhanced Raman scattering spectroscopy (SERS). Dr. ***Damin A.*** (*Turin, Italy*) highlighted aspects of synthesis and characterization of Au/SiO_2 systems for SERS. Professor ***Dragan A.I.*** (*Kyiv, Ukraine*) described recent progress and perspectives of metal-enhances fluorescence (MEF) in biomedical studies. Dr. ***Boiko V.*** (*Wrocław, Poland*) told about potentialities of near-infrared persistent luminescence phosphors nanoparticles for optical imaging of biological tissues. Professor ***Berzina B.*** (*Riga, Latvia*) discussed applications of luminescent nanoparticles for optical imaging of biological materials and tracing the processes occurring in biomaterials. Professor ***Lukowiak A.*** (*Wrocław, Poland*) reported about luminescent bioactive glasses and composites.

Physical properties of complex biomolecular nanosystems were exemplified at the cell and biomembrane levels. Professor ***Martra G.*** (*Turin, Italy*) covered the issue of the interactions of silica nanoparticles with membranes and discussed the insights on surface features responsible for membranolysis. Dr. ***Berest V.P.*** (*Kharkiv, Ukraine*) reported about membranotropic action of Gramicidin S and its relation to lipid membrane composition. Dr. ***Artemenko A.*** (*Prague, Czech Republic*) told about biocompatible substrate on the basis of nanocrystalline diamond films for proteins absorption. Professor ***Yesylevskyy S.A.*** (*Kyiv, Ukraine; Besancon, France*) described recent methodological advances in molecular

dynamics simulation of the curved membranes. In the lectures of Dr. ***Nasr M***. (*Zewail, Egypt*), Professor ***Dovbeshko G.I.*** (*Kyiv, Ukraine*) and Professor ***Matta C.F.*** (*Halifax, Canada*) (last in format of video presentation) the problems of biophysical role of mitochondria, its vibrational markers and controlled thermogenesis in mitochondrion were considered. Dr. ***Ilchenko O.*** (*Lyngby, Denmark*) told about a new generation of Raman instruments and an application of Raman spectroscopy for mapping of orientation of semiconductor crystals and pharmaceutic tablet formulation (via Skype).

In the framework of the conference special sessions devoted to the progress of collaborative projects related to NanoBioPhysics subjects were organized. A round table dedicated to HORIZON 2020 project "Asymmetry of biological membrane: theoretical, experimental and applied aspects" (690853 — assymcurv - H2020 – MSCA - RISE-2015) was moderated by the project coordinator Professor ***Dovbeshko G.I.*** (*Kyiv, Ukraine*). NATO SPS 985291 project Workshop "Towards getting of "lipid passport" of pathogenic microorganisms by physical and computational lipidomics" was conducted by the coordinator Professor ***Bogdanov M.*** (*Houston, USA*) under the motto "Moving from conventional lipidomics to physical and computational lipidomics, e.g. building of supramolecular lipid structures". In the lecture of Professor ***Bogdanov M.*** the challenging questions were raised: "What new strategies do successful pathogenic bacteria deploy to "camouflage" their surface such that it is not recognized either by infected host or "man made" surveillances systems? What strategies can be developed by us?" A number of urgent topics were surveyed at the Wokshop in the presentations of Professor ***Dovbeshko G.I.*** (*Kyiv, Ukraine*) "IR and Raman markers of artificial and real membranes and their changes under external stimuli", Professor ***Rinken A.*** (*Tartu, Estonia*) "Possibilities of fluorescent spectroscopy for visualization of supramolecular lipid structures", Professors ***Ramseyer C.*** and ***Yesylevskyy S.A.*** (*Besancon, France*) "Computer-aided molecular dynamic simulations of supramolecular lipid structures".

The best posters were awarded: on the first day, poster presented by ***Cheropkina H.*** (*Turin, Italy*) "Electrochemical detection of pesticides by human flavin-containing mono-oxygenase 1" was recognized as the best one (chairman Dr. ***Berest V.P.***); on the second day ***Tarabara***'s ***U.*** (*Kharkiv, Ukraine*) poster "Competitive DNA binding of europium coordination complexes and trimethine cyanine dyes" was the best one (chairman Professor ***Lukowiak A.***).

The conference was partially sponsored by the HORIZON 2020 project, NATO 985291 SPS project "A novel method of detection of biohazards", and the Project 11/1 2019 of National Academy of Sciences of Ukraine "Development of 2D materials and "smart" sensors for biomedical and biological purposes".

The next conference of the series is expected to be organized in autumn 2021 in Kharkiv.

In this issue ***Biophysical Bulletin*** publishes some articles based on materials presented at the NBP-2019 Conference.

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Conflict of interests: the authors declare that there is no conflict of interest.

REFERENCES

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6-та МІЖНАРОДНА КОНФЕРЕНЦІЯ «НАНОБІОФІЗИКА: ФУНДАМЕНТАЛЬНІ ТА ПРИКЛАДНІ АСПЕКТИ»

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Шоста міжнародна конференція «НАНОБІОФІЗИКА: фундаментальні та прикладні аспекти» (NBP-2019) відбулася 1–4 жовтня 2019 р. в Інституті фізики Національної академії наук України (Київ, Україна). Попередні п'ять конференцій, починаючи з 2009 року, проводилися один раз на два роки спільними зусиллями Фізико-технічного інституту низьких температур ім. Б.І. Вєркіна НАН України та Інституту фізики НАН України по черзі у Харкові та Києві. У конференції взяли участь 63 провідних науковця з 14 країн світу, зокрема з України, Білорусі, Італії, Франції, Латвії, Литви, Естонії, Німеччини, Польщі, Чеської Республіки, Канади, Данії, США та Арабскої Республіки Єгипет. Було представлено 36 наукових доповідей та понад сотні стендових презентацій. Метою конференції став обмін інформацією стосовно новітніх досягнень у галузі нанобіофізики, спрямований на стимулювання подальшого розвитку як фундаментальних досліджень, так і інновацій у відповідних галузях нанотехнології. Дружній формат наукового зібрання забезпечив обмін ідеями у рамках таких актуальних тематик як фізичні властивості біомолекулярних наносистем, взаємодія біомолекул з наночастинками та наноструктурованими поверхнями, посилення оптичних процесів у біомолекулах внаслідок їх взаємодії з наноструктурованими металевими поверхнями, створення наногібридів біомолекул з вуглецевими наноструктурами, теорія та комп'ютерне моделювання наноскопічних біологічних систем, практичне застосування біонаноматеріалів та біонанокомпозитів. У рамках конференції було організовано спеціальні сесії для спілкування учасників поточних міжнародних проектів за програмами HORIZON 2020 та NATO Workshop. Матеріали конференції NBP-2019 видано у збірці тез.

КЛЮЧОВІ СЛОВА: нанобіофізика; бімолекулярні наносистеми; біонаноматеріали; біонанокомпозити; наноструктуровані поверхні; міжмолекулярні взаємодії; комп'ютерне моделювання.

6-я МЕЖДУНАРОДНАЯ КОНФЕРЕНЦИЯ «НАНОБИОФИЗИКА: ФУНДАМЕНТАЛЬНЫЕ И ПРИКЛАДНЫЕ АСПЕКТЫ»

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Шестая международная конференция «НАНОБИОФИЗИКА: фундаментальные и прикладные аспекты» (NBP-2019) состоялась 1–4 октября 2019 г. в Институте физики Национальной академии наук Украины (Киев, Украина). Первые пять конференций, начиная с 2009 года, проводились с двухгодичным интервалом совместными усилиями Физико-технического института низких температур им. Б.И. Веркина НАН Украины и Института физики НАН Украины поочередно в Харькове и Киеве. В конференции приняли участие 63 ведущих ученых из 14 стран, в частности, Украины, Беларуси, Италии, Франции, Латвии, Литвы, Эстонии, Германии, Польши, Чешской Республики, Канады, Дании, США и Арабской Республики Египет. Было представлено 36 научных докладов и более сотни стендовых презентаций. Целью конференции являлся обмен

информацией о новых достижениях в области нанобиофизики, направленный на симулирование дальнейшего развития как фундаментальных исследований, так и инноваций в соответствующих областях нанотехнологии. Обсуждение проходило в рамках таких актуальных тематик как физические свойства биомолекулярных наносистем, взаимодействие биомолекул с наночастицами и наноструктурированными поверхностями, усиление оптических процессов в биомолекулах вследствие их взаимодействия с наноструктурированными металлическими поверхностями, создание наногибридов биомолекул с углеродными наноструктурами, теория и компьютерное моделирование наноскопических биологических систем, практическое применение бионаноматериалов и бионанокомпозитов. В рамках конференции была организована специальная сессия для общения участников текущих международных проектов по программам HORIZON 2020 и NATO Workshop. По материалам конференции NBP-2019 издан сборник тезисов.
КЛЮЧЕВЫЕ СЛОВА: нанобиофизика; биомолекулярные наносистемы; бионаноматериалы; бионанокомпозиты; наноструктурированные поверхности; межмолекулярные взаимодействия; компьютерное моделирование.

6th INTERNATIONAL CONFERENCE “NANOBIOPHYSICS: FUNDAMENTAL AND APPLIED ASPECTS”

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6th International conference “NANOBIOPHYSICS: Fundamental and Applied Aspects” (NBP-2019) took place on October 1–4, 2019 at the Institute of Physics of the National Academy of Sciences of Ukraine (Kyiv, Ukraine). Previous five conferences, starting from 2009, were organized due to joint efforts of B. Verkin Institute for Low Temperature Physics and Engineering of the NAS of Ukraine and Institute of Physics of the NAS of Ukraine on biennial basis in Kyiv and Kharkiv alternatively.63 leading scientists from 14 countries took part in the conference, Ukraine, Belarus, Italy, France, Latvia, Lithuania, Estonia, Germany, Poland, Czech Republic, Canada, Denmark, USA and Arab Republic of Egypt were represented. 36 scientific lectures, including 17 invited, and 27 poster presentations were made. The goal of the conference was in exchange of information concerning recent achievements in the field of nanobiophysics, aimed at the inspiration of further advancement of basic investigations as well as innovations in the related areas of nanotechnology. Friendly format of the scientific meeting provided the exchange of ideas in such urgent topics as physical properties of biomolecular nanosystems, interactions of biomolecules with nanoparticles and nanostructured surfaces, enhancement of optical processes in biomolecules by nanostructured metal surfaces, formation of nanohybrids of biomolecules with carbon nanostructures, theory and computer modeling of nanoscopic biological systems, applications of bionanomaterials and bionanocomposites. In the framework of the conference special sessions for communications between the participants of the current international projects HORIZON 2020 and NATO Workshop were organized. Book of abstract based on NBP-2019 materials was published.
KEY WORDS: nanobiophysics; biomolecular nanosystems; bionanomaterials; bionanocomposites; nanostructured surfaces; intermolecular interactions; computer simulation.