

REVIEW

Regarding a competition for the academic position of "Associate Professor" in the field of higher education 4. "Natural Sciences, Mathematics and Informatics", in the professional field 4.3. Biological Sciences, scientific specialty "Biophysics", for the needs of the department "Electroinduced and Adhesive Properties", IBPBME-BAS, promulgated in the State Gazette No. 58/July 18, 2025 with the sole candidate Major Assistant Professor Kamelia Todorova Hristova-Panusheva, PhD, working on a employment contract in the same department.

Reviewer: Assoc. Prof. Veselina Svetoslavova Moskova-Doumanova, PhD, Department of Cell Biology and Biology of Development, Faculty of Biology, Sofia University "St. Kliment Ohridski"

As a member of the Scientific Jury for the cited competition, appointed by order No. 749/September 17, 2025 of the Director of the Institute of IBPBME -BAS, I have received all the required documents and prepared the review for the competition in accordance with the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for its Implementation and the Regulations for the Implementation of the ADASRB at the IBPBME at the Bulgarian Academy of Sciences.

1. PERSONAL DATA AND PROFESSIONAL DEVELOPMENT OF THE CANDIDATE

The candidate for the academic position of "associate professor" - major assistant professor Kamelia Todorova Hristova-Panusheva PhD, was born on July 27, 1980 in the city of Vidin. She completed her higher education at Sofia University "St. Kliment Ohridski", where she successively obtained a bachelor's degree in Biology (1999-2003), and subsequently a master's degree in Cell Biology and Pathology (2003-2005). Her scientific development continued with the position of "assistant professor" at the "Cell Adhesion" department, IBP-BAS, in the period 2005-2006. Her professional path after that was entirely in the "Electroinduced and Adhesive Properties" department, IBPBMI-BAS, where from 2006 to 2009 she was a full-time doctoral student, and in the period 2010-2012 an assistant professor. As part of her doctoral training, she completed three short-term doctoral specializations at scientific institutions abroad – two of the specializations were at the Institute of Bioengineering of Catalonia, Seville, Spain, and one was at the Martin Luther University, Halle, Germany. In

2011, she successfully defended her PhD thesis on the topic “Modulated Interaction of Osteoblasts with Hydroxyapatite Materials”, under the supervision of Prof. Dr. Georgi Altankov, DSc.

After obtaining her PhD, Kamelia Hristova-Panusheva continues to work as a major assistant in the same department.

Dr. Hristova-Panusheva speaks English at an excellent level, and also Spanish and Russian at an elementary level. She has good computer literacy, including practical skills in working with analytical and graphical software (MS Office, Origin, GraphPad Prism, Las X, etc.). The professional path and the experience of major assist. prof. Hristova-Panusheva, PhD demonstrate her maturity as a researcher and scientist.

2. SCIENTIFIC ACTIVITY

According to the Scopus database, major assist. prof. Kamelia Hristova-Panusheva, PhD is the author or co-author of 29 papers in scientific journals with an impact factor (IF) or SJR rank. The scientific production submitted for participation in this competition includes a total of 19 original scientific articles published in renowned international journals that have not been used in other procedures and one chapter of a book published by the international scientific publishing house Elsevier. Of the submitted articles: 9 are in first quartile journals (Q1); 1 in Q2 journal; 2 in Q3 journals; 2 in Q4 journals. Particularly indicative of the high value of the submitted publications is the fact that almost half of them are in first quartile journals (Q1) according to the Scopus/Scimago classification. Many of the journals have a high impact factor and international recognition, such as *Cells* (IF 5.2), *Molecules* (IF 4.6), *Pharmaceutical* (IF 4.8), etc. This fact clearly demonstrates the relevance of the topic developed by the candidate, her scientific maturity, and her ability to present her scientific achievements in the best possible way to the scientific community.

The main scientific area of major asst. prof. Kamelia Hristova-Panuseva is on the interaction of cells with nanoparticles or biomaterial surfaces. This includes establishing the biological effects and cytotoxicity of nanoparticles, biocompatibility of the tested materials and development of strategies for their improvement. Non-cancerous and cancer cell lines, as well as whole organs, have been used as model systems in most of the studies, which allows the determination of biological effects at the cellular and organ levels. Additional fields of scientific research of Dr. Hristova-Panuseva are studies of various pharmacological products, plant extracts and composite materials on the adhesive behavior of non-cancerous and cancer cells, mitochondrial activity and biocompatibility.

The candidate's scientific work can be systematized into two clearly distinct scientific areas in which she demonstrates original contribution and applicability.

A. Investigation of the biological effects of newly synthesized or newly modified materials with potential applications as antitumor agents or for tissue engineering:

1. Investigation of potential antitumor effects at cellular, subcellular and organ levels of graphene oxide (GO), pegylated graphene oxide (GO-PEG) and gold nanoparticles in combination with femtominute or near-infrared laser irradiation. The results of these studies are published in four experimental papers [publications B4.1, B4.2, B4.4 and B4.5] and one review publication [B4.3]. Original contributions in this field of research are:

- It has been found that PEGylation of graphene oxide nanoparticles improves their biocompatibility, leads to an increase in the activity of the enzyme deamineoxidase, but that the particles induce different effects on intact and non-intact mitochondria, with respect to ATPase activity, and these effects are enhanced by laser irradiation in the NIR region; It has also been shown that GO and GO-PEG induce arrhythmic contractions in an isolated frog heart and this effect is not changed after NIR irradiation of the nanoparticles.

- A molecular mechanism underlying the effects exerted by GO and GO-PEG and NIR irradiation has been suggested, as changes in the expression of several genes related to apoptosis, cell cycle regulation and autophagy have been identified.

- It was found that GO-PEG has better photothermal efficiency than GO under Fs-irradiation with a certain wavelength, with the increase in the temperature of the cell environment being directly dependent on the power density and the duration of irradiation;

- Selective cytotoxicity on cancer cells was achieved; a synergistic photothermal effect of gold nanoparticles and low intensity laser irradiation was demonstrated, which was more pronounced on cancer cells.

2. Investigation of the biological effects of aminated graphene oxide at the cellular and subcellular level in cancer cells, normal embryonic cells and isolated liver mitochondria. The contributions of these studies are:

- The effects of GO amination on the physicochemical characteristics of nanoparticles, as well as their cell-specific mechanism of cytotoxicity has been assessed, which in colon cancer cells is demonstrated by increased ROS production, cell cycle arrest in G0-G1 and DNA damage, while in normal embryonic and lung cancer cells it is DNA damage and cell cycle arrest in G2-M [publications Γ7.7 – Γ7.9].

- A toxic effect of GO and GO-NH₂ on both intact and decoupled mitochondria has been established, but a different effect with respect to ATPase activity and ROS production [publication Γ7.13].

3. Biological characterization of new materials and coatings for application in tissue engineering, with regard to their effects on cell adhesion, functioning and differentiation of cells. Original contributions in this area are related to:

- Development and optimization of plasma-polymerized coatings and thin layers of hexamethyldisiloxane. The biological effects of thus obtained surfaces have been established in terms of the adsorption of proteins important for cell adhesion, interaction with endothelial cells and the formation of focal adhesion contacts [publications Γ7.2, Γ7.3, Γ7.4, Γ8.1].

- Development of a new composite material based on PPHMDS and detonated diamond (DND). Positive biological effect of the addition of DND has been proven, expressed in improved cell adhesion, protein adsorption and the behavior of mesenchymal stem cells and MG63 cells [publications Γ7.3 and Γ8.1].

- Generation of thin composite layers of polydimethylsiloxane and DND with different elastic modulus, and the behavior and osteogenic differentiation of mesenchymal stem cells and myogenic differentiation of myoblast cells on them have been evaluated [publications Γ7.5, Γ7.6, Γ7.11].

4. Investigation of the biocompatibility of two-layer TiN/TiO₂ coatings deposited by DC magnetic sputtering on stainless steel. The original contributions in this field are related to the establishment of the biocompatibility of the tested surfaces by evaluating the changes in cell spreading and proliferative capacity of cultured cells [publication Γ7.10].

B. Evaluation of the biological effects of pharmacological substances of natural or synthetic origin

1. Study of the effects of the inhalation anesthetic halothane on focal adhesion contacts of A549 cells. Disturbances in focal adhesion contacts were found upon treatment with physiologically relevant concentrations of the anesthetic, and the molecular mechanism underlying this disturbance was shown, namely suppression of focal adhesion kinase activity and paxillin phosphorylation [publication Γ7.1].

2. Safety study of total ethanol extract from *in vitro* culture of *Haberlea rhodopensis*. Low cytotoxicity was demonstrated on human embryonic cell line, assessed by monitoring cell survival, free radical generation, lack of genotoxic effect, positive effect on mitochondrial

activity and morphology, which were classified as evidence of cellular rejuvenation [publication Г7.14].

3. Study of the effect of a new plant cystatin on the adhesion behavior of cells of different origins. The effects of dgECP1 and its mutant dgECPm1 on normal and cancer breast cells were monitored. It was found that the effect of normal cystatin on the adhesion of cancer cells depends on whether it is adsorbed on the substrate or dissolved in the culture medium, while the mutant form has a negative effect, regardless of the method of application. The effect of both cystatins on normal cells has been assessed as minimal, making this natural cystatin a promising candidate for modulating adhesion in cancer cells [publication 7.12].

3. FULFILMENT OF THE MINIMAL NATIONAL REQUIREMENTS FOR OCCUPATION IN THE POSITION OF ASSOCIATE PROFESSOR ACCORDING TO THE ADASRB, THE REGULATION FOR ITS IMPLEMENTATION, AS WELL AS THE ADDITIONAL REQUIREMENTS ACCORDING THE REGULATION FOR THE IMPLEMENTATION OF THE ADASRB AT THE IBPBME - BAS

In Dr. Hristova-Panusheva's report on the fulfillment of the minimum national requirements for the relevant scientific field and the additional requirements of the IBPBME - BAS, five of the submitted articles are included in indicator B, which, according to the candidate, carry a total of 120 points out of the required 100 points. A reference in Scimago Journal rank revealed that publication B4.3 is in a journal that in 2024 falls into Q1, and not as indicated by the candidate into Q2, with which the actual number of points in indicator group B is 125. To fulfill the criteria in group Г, 14 articles and a book chapter were submitted, which carry 239 points (out of the required 220 points). Despite the interdisciplinary nature of the teams that carried out these studies, Dr. Hristova-Panusheva is the first author in over 15% of the submitted publications, which emphasizes the significant personal contribution to these studies.

In the period of time from the defense of her PhD thesis to the preparation of this review, according to Scopus, Dr. Hristova-Panusheva has been cited in over 200 publications, which significantly exceeds the requirements of 60 points (30 citations) in the group of indicators D. She has a Hirsch index (h-index) of 6, which is a serious indicator of active and sustainable scientific productivity. These citations are in journals with an impact factor, including International journal of pharmaceutics (Q1), Drug Delivery and Translational Research (Q1), Critical Reviews in Oncology/Hematology (Q1), Polymers (Q1), Current Pharmaceutical Design (Q2), Therapeutic Delivery (Q2), Frontiers in Nanotechnology (Q2), etc. Her

publications have been cited by scientists from all over the world, which emphasizes the broad international impact of her scientific work. Some of the most cited articles include articles published in *Oxidative Medicine and Cellular Longevity* [publication Г7.9] – 47 citations and in *Pharmaceuticals* [publication B4.3] – 43 times, after removing self-citations. It is particularly impressive that the last publication [publication B4.3], in which the candidate is the first author, has gained citations in just one year (published in 2024). These data highlight the relevance of the candidate's research, as well as its integration into the international scientific community. There is clear scientific sustainability of Dr. Hristova-Panusheva researches, high citations and real impact on the development of interdisciplinary areas, such as biomaterials, their functionalization and assessment of their biocompatibility.

In this competition, Kamelia Hristova-Panusheva, PhD has submitted 10 publications in journals with Impact Factor (IF), which exceeds the additional requirement of a minimum of 8 publications with IF according to Annex 1 of the Regulations for the implementation of the ADASRB in the IBPBME at the Bulgarian Academy of Sciences. These publications have a total IF of 39.83, which is an additional certificate for the quality of the presented scientific production.

4. CONCLUSION AND RECOMMENDATION

After careful and thorough acquaintance with the documents submitted by Major Asst. Prof. Kamelia Todorova Hristova-Panusheva, PhD in the competition for the academic position of "Associate Professor" in the professional field 4.3. Biological Sciences, scientific specialty Biophysics, I can make the following objective assessment:

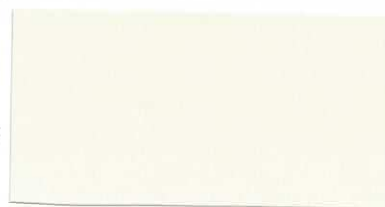
The submitted materials convincingly show that the candidate is an established scientist who not only meets, but also exceeds the minimum national and institutional requirements for holding the position of "Associate Professor". Her scientific output is mature, purposeful and thematically consistent, focused on several current areas in modern science of biomaterials and biocompatibility. Papers of Dr. Hristova-Panusheva contain original and confirmatory contributions, and are of clear potential applied focus. It is particularly significant that half of the scientific articles submitted for the competition have been published in peer-reviewed international journals from the first quartile (Q1), which confirms the high quality, relevance and international recognition of her research. The candidate demonstrates stable development as an independent researcher, with a distinctly interdisciplinary approach. Her publication profile clearly shows an upward dynamic in terms of intensity, visibility and scientific impact.

Based on the above, I give my positive assessment and recommend to the esteemed scientific jury that Major Assistant Professor Kamelia Todorova Hristova-Panusheva, PhD be elected as an "Associate Professor" in the professional field 4.3. Biological Sciences, scientific specialty Biophysics, for the needs of the department "Electroinduced and Adhesive Properties", IBPBME-BAS.

November 21, 2025

Sofia

Reviewer:



(Assoc. Prof. V. Moskova-Dumanova, PhD)