

REVIEW

Considering the competition for **the academic position "Associate Professor"** in the field of professional direction 4.3. "Biological Sciences", scientific specialty "Biophysics", for the needs of the Faculty of Physics of SU "St. Kliment Ohridski" announced in "State Gazette", issue 88, published on October 18, 2025.

Reviewer: Prof. Emilia Lyubomirova Apostolova, PhD, Institute of Biophysics and Biomedical Engineering – Bulgarian Academy of Sciences, member of the Scientific Jury according to order No. ПД-38-661/03.12.2024 of the Rector of Sofia University "St. Kliment Ohridski".

Candidate: Senior Assist. Prof. Elitsa Lyubomirova Pavlova , PhD

For participation in the announced competition for **the academic position "Associate Professor"**, one candidate has submitted documents: Senior Assist. Prof. Dr. Elitsa Lyubomirova Pavlova. The candidate has attached all the necessary documents in accordance with the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria as well as the Regulations for its application approved by SU "St. Kliment Ohridski". It is noticeable that the documents are very poorly formatted, arranged and with many errors. On 03.02.2025, Dr. Pavlova submitted additional documents, in which the articles were rearranged according to the indicators in the Act on Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its application. Three new articles were also included. Corrections were also made of the contributions, and new contributions from the added articles were also included.

Education and career development

Dr. Elitsa Pavlova graduated in 2001 with a master's degree in "Biology"(2001) and a master's degree in "Biology and Chemistry" (2002) at the Faculty of Biology of the Sofia University "St. Kliment Ohridski". She defended a dissertation and received the educational and scientific degree "doctor" in 2007. The topic of the dissertation is: "Evaluated biomarkers of oxidative stress". Dr. Pavlova started working at Sofia University "St. Kliment Ohridski" in 2005 as a specialist chemist, and from 2011 until now she holds the academic position of chief assistant in the Department of "Optics and Spectroscopy", the Faculty of Physics, Sofia University "St. Kliment Ohridski".

Research activity

Dr. Pavlova's total publication activity includes 34 publications (according to the reference submitted by the candidate), of which 10 are included in the the educational and scientific degree "doctor". In the report to the WHO (World Health Organization), her name does not appear, and it is not clear what her participation is. For participation in the competition for "associate professor", Dr. Pavlova has submitted 20 publications with IF or SJR (Q1 - 6, Q2 - 6, Q3 - 4, Q4 - 1, SJR - 3), with 15 of these publications being in the last 5 years. Dr. Pavlova is the first or last author of 10 publications. The reference also presents 147 citations. The large number of citations of Dr. Pavlova's publications shows the relevance of her scientific and research activities. The candidate's h-index is 6. The scientific output, as well as the response she has received in the scientific community, shows the seriousness and relevance of her research activities.

Analysis of Dr. Pavlova's documents for compliance with the requirements of the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria as well as the Regulations for its application approved by SU "St. Kliment Ohridski".

Indicator A - successfully defended a dissertation and received the educational and scientific degree "doctor" - 50 points.

Indicator B - 7 publications are included (Q1 - 1, Q2 - 3, Q4 - 1, SJR - 2). The total number of points is 117, with a required 100.

Indicator D - 13 publications are included (Q1 - 5, Q2 - 3, Q3 - 4, SJR - 1). The total number of points is 255, with a required 200.

Indicator E - a list of 147 citations is presented. The total number of points is 294, with a required 50.

Indicator E - (not required for associate professor). The points for this indicator in the table presented by the candidate are 167, but due to the lack of evidence and part of the activities in this indicator, 117 cannot be recognized. The reference submitted by the candidate does not contain complete information about the projects. Evidence is presented for only one project.

From the submitted reference is clear that Dr. Pavlova significantly exceeds the additional requirements of the Faculty of Physics of Sofia University "St. Kliment Ohridski".

Two lists are presented for participation in conferences: In the first list (11.AuthorsSummary_AVTORITE_SU) there are 58 section reports, and in 30 of them the name of the candidate does not appear and it is not clear what his contribution is. Two posters with the names of other authors are also presented. The second list (presented in the candidate's CV) includes 60 participations in scientific forums from 1999 to 2023).

Educational activity

Doctor Pavlova was the supervisor or consultant of the diploma theses of 17 students, of which 4 for receiving a master's degree and 13 for receiving a bachelor's degree. According to these indicators, Dr. Pavlova significantly exceeds the specific requirements of the Faculty of Physics of Sofia University "St. Kliment Ohridski". For the period 2019 -2024, the candidate has 2731 hours of teaching employment, of which 2516 hours of classroom employment, but the lecture courses and practical classes are not indicated.

Scientific contributions of the candidate – main directions and more important results

The scientific works included in the reference are divided into five main thematic areas:

The first two thematic areas involve research into the effects of new combinations of antiviral drugs and antioxidants. Some the most important scientific contributions are:

- The synergistic effect of oseltamivir, isoprinosine, and flagyl acid on H3N2 influenza virus infection in mice has been established [Publication B1]
- Investigating the effect of resistin on oxidative stress in breast cancer, it founds that lower concentrations of resistin have a significant prooxidant effect in cancer cells (MCF-7, MDA-MB-231). The potential role of resistin as a metabolic signaling molecule and its ability to participate in processes related to inflammation and breast cancer progression was shown. It was found that resistin is more effective as a prooxidant at lower concentrations (12.5 ng/ml) than at higher concentrations (25.0 ng/ml). [Publication Γ7].
- The potential role of resistin as a metabolic signaling molecule and its potential to participate in processes related to inflammation and breast cancer progression has been demonstrated. Resistin was found to be more effective as a prooxidant at lower concentrations (12.5 ng/ml) than at higher concentrations (25.0 ng/ml). [Publication 14].
- Polyphenolic extract from red geranium (*Geranium sandineum* L.) has been found to be a source of natural antioxidants, with a therapeutic dose of 0.1 mg/ml. Experimental results have been obtained showing that this extract can be used for therapy and modulation of drug metabolism during influenza virus infection [Publications B4, Γ1].
- Studying the antioxidant activity of the nucleotide (N) and spike (S) proteins of SARS-CoV-2, it was found that these viral proteins have strong antioxidant activity, which also suggests their protective role against oxidative stress induced by the body's immune response to infections. It is likely that the effective protective mechanism of the viral N and S proteins against ROS is a strategy developed and maintained during the evolutionary process against the aggressive and destructive products of the immune system. [Publication Γ6].
- Experimental evidence is presented that ethanol extract of *Tanacetum vulgare* L. on the viruses: herpes simplex type 1 (HSV-1), influenza virus A (H3N2) and coxsackievirus B1 (CVB1). The extract showed a significant inhibitory effect on the replication of HSV-1, moderate antiviral activity against H3N2, but no effect on CVB1. The results of these studies also determine the possibilities for future prophylactic and therapeutic applications of the extract of *Tanacetum vulgare* L. [Publication B6].

The third thematic area includes research to assess the safety or toxicity of various nanomaterials or nanoparticles.

- The antibacterial effect of TiO₂:Cu nanocomposite thin films on the bacterium *Pseudomonas putida* at room temperature has been established. The obtained results reveal a potential application of this nanomaterial for antibacterial coatings in medical practice to reduce the risk of infections. [Publication B5].
- The antibacterial activity of Fe₂O₄ and TiO₂ nanoparticles against Gram-positive and Gram-negative bacteria has been established. Studies also show that this effect of TiO₂ is enhanced by the alkaloid thalikarpine [Publication B7].
- The biological and prooxidant activity of newly synthesized zinc oxide (ZnO) nanostructures, including nanoclusters and nanoparticles coated with SiO₂, has been investigated. Experimental materials are presented, which offer new perspectives for the application of ZnO nanomaterials as an alternative to traditional antibiotics [Publication Γ3].
- Studies to evaluate the prooxidant, antioxidant and biological activity of newly synthesized nanocomposites of reduced graphene oxide (RGO) and its combinations with silver and copper reveal the possibilities for the application of these nanomaterials in antimicrobial and antiviral therapy and in the production of biomedical implants [Publication Γ4].
- Graphene composites with added ZnO and Cu were found to exhibit strong antibacterial activity against *Escherichia coli* and *Staphylococcus epidermidis*, while composites with ZnO and Ag showed stable antioxidant properties at physiological pH [Publication Γ5].
- A review of the antimicrobial properties of copper and copper nanoparticles has been conducted, focusing on their potential as an alternative to antibiotics in the fight against infections. The review presents the main mechanisms for the inactivation of bacteria, viruses and fungi by copper nanoparticles, as well as methods for the green biosynthesis of these nanoparticles [Publication Γ8].
- Antibacterial properties and prooxidant activity of hybrid materials based on silica and polyvinylpyrrolidone (SiO₂/20PVP) have been established. It has also been shown that SiO₂/20PVP in combination with the antibiotics vancomycin and ciprofloxacin significantly increases the effectiveness against various bacterial strains. [Publication Γ10].
- A method for the synthesis of biocompatible zinc oxide nanoparticles (ZnO-NPs) using the plant *Heliotropium rariflorum* has been developed. Antibacterial, antifungal, antioxidant, analgesic and antipyretic properties of these

nanoparticles have been established, which determines their potential use in medicine (publication Г11).

- The antimicrobial and oxidative properties of silver-substituted zeolites X and ZSM-5 were investigated, as well as their ecotoxicity. The study showed that the bactericidal efficacy of the materials was proportional to the silver content, with AgX with a high silver content demonstrating a stronger effect. Furthermore, tests on *Daphnia magna* revealed a potential ecological risk at higher concentrations, highlighting the need for controlled use of these materials. [Publication Г13].

The fourth thematic area is related to the development of new biosensor systems for application in clinical practice.

- A method for depositing thin layers of hemoglobin, myoglobin or hemin using MAPLE (Matrix-Assisted Pulsed-Laser Evaporation) technology has been developed. The resulting layers preserve the biological activity of the proteins and can be used for sensors based on surface plasmon resonance (SPR), effectively detecting the binding of gases such as CO, CO₂ or NO [Publications B2, B3 and Г2].

The fifth thematic area is related to assessing the activity of the BCG vaccine with a new ATP-luminescent test in Bulgaria.

- A modified rapid ATP test for determining the viability of lyophilized BCG vaccine has been developed, based on a method recently introduced by the Statens Serum Institute (SSI), Copenhagen. The studies performed support the implementation of the ATP test as part of routine quality control in the production of BCG vaccines [publications B1 and Г9].

Personal contribution of the candidate

Dr. Pavlova's contribution is related to the measurement and analysis of biomarkers of oxidative stress under various influences and chemiluminescent tests. She participates in determining the conditions of stability and functionality when creating biosensors by applying thin layers of hemoglobin, myoglobin or hemin using the MAPLE technology, as well as establishing a correlation between the results of the ATP test and the standard microbiological test for assessing the number of living units.

Critical remarks, recommendations and questions

One of my remarks is the poor formatting and errors in the submitted documents. I advise Dr. Pavlova to pay more attention to the formatting of the documents when participating in future competitions.

The scientific papers proposed to me for review contain a lot of new information about the influence of various plant extracts, antiviral drugs and nanomaterials for the prevention and

treatment of various diseases. In the proposed habilitation report, Dr. Pavlova emphasized the possibilities for applying the obtained results, but did not emphasize what is new in these studies. When presenting contributions, it is good to summarize the results, and not to describe the result in the corresponding article. Such a summary was made in the fourth and fifth thematic areas.

What are Dr. Pavlova's plans for her future research and teaching work?

Conclusion

From the submitted documents and references on the competition, it is clear that the scientific production and scientometric indicators of Dr. Pavlova meet and even exceed the recommended requirements for occupying the academic position of "associate professor" according to the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law at Sofia University "St. Kliment Ohridski".

Based on the above, I would like to recommend to the members of the Scientific Jury to propose to the Faculty Council of the Faculty of Physics of Sofia University "St. Kliment Ohridski" to elect for to elect **Dr. Elitsa Pavlova for the academic position "Associate Professor"** in the professional field 4.3. "Biological Sciences", scientific specialty "Biophysics".

February 18, 2025

Sofia

Signature:

/Prof. Dr. Emilia Apostolova/