

## **REVIEW**

on the procedure for acquiring the academic position „Professor” in professional field 4.1. Physical Sciences (Medical Physics), published in the State Gazette, issue 103, December 10, 2021, for the needs of the Faculty of Medicine, Department of Physics, Biophysics and Radiology

**Candidate: Assoc. Prof. Genoveva Antonova Zlateva, PhD**

**Reviewer: Assoc. Prof. Plamen Georgiev Getsov, MD, PhD** – Department of Imaging Diagnostic, Faculty of Medicine, MU-Sofia, Clinic of Imaging Diagnostic, University General Hospital “Queen Yoanna” - ISUL

The review was prepared based on the Law for Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for application of the ZRASRB and the Regulations for the conditions for acquiring scientific degrees and for obtaining academic positions at Sofia University “St. Kliment Ohridski” (PURPNSZADSU). It was written and presented, based on order № ПД-38-102/08.02.2022 г. of the Rector of Sofia University “St. Kliment Ohridski” for appointment of the scientific jury for this procedure, as well as a decision of the scientific jury regarding the procedure.

Documents for participation in the procedure, within the legally regulated period, are submitted electronically by the only candidate: **Assoc. Prof. Genoveva Antonova Zlateva, PhD.**

### **1. General description of the submitted materials**

I was given access to the candidate's documents before the first meeting of the scientific jury by the secretary of the jury. The candidate has submitted all the required materials, in accordance with PURPNSZADSU: CV; copies of higher education diplomas; copy of the diploma for scientific degree „doctor”; certificate for professional experience in the academic position "assistant", “senior assistant”, “chief assistant” and “associate professor”; reference for educational workload; list of all publications; list of publications submitted for participation in the procedure; a list of publications, conferences, projects and scientific manuals generated by the „Authors” system; reference for fulfilment of the minimum national requirements, according to the Regulations for application of the ZRASRB; reference for citations; author’s

reference for the contributory impact of the scientific works; reference on the indicators under Art. 122, para. 2 of PURPNSZADSU, copies of scientific papers; a copy of the announcement in the State Gazette. In addition, Assoc. Prof. Zlateva presented a copy of the diploma for the acquired specialty "Biophysics" in the health care system, under Ordinance № 1 of the Ministry of Health, from January 22, 2015, which is especially important for lecturers in medical schools in the country.

## **2. Brief biographical data**

Assoc. Prof. Genoveva Antonova Zlateva was born on October 12, 1964 in the town of Nikopol. She graduated from the Faculty of Physics at Sofia University „St. Kliment Ohridski” in 1987, majoring in Physics with a specialization in Solid State Physics. For the period 1989-1992 she was a full-time doctoral student and defended her doctoral dissertation on the topic: „Study of the phonon structure and the effects of cation substitution in some superconducting and non-superconducting complex copper oxide systems” in 1994. In 1999 she acquired a diploma in „Biophysics” in the healthcare system.

From 1994 to 2007 Assoc. Prof. Zlateva held consecutive academic positions „Assistant”, „Senior Assistant” and „Chief Assistant” in the Department of Physics and Biophysics of MU-Sofia. Since 2007 she has held the academic position of „Associate Professor” at the Medical Faculty of Sofia University „St. Kliment Ohridski”, and the following leading administrative positions:

- for the period 2010-2019 – Head of the Department of Physics, Biophysics and Radiology;
- from 2009 to 2012 and from 2019 to the present – Vice-Dean of the Medical Faculty of Sofia University „St. Kliment Ohridski”;
- for the period 2019-2020 – Head of the University Center for Quality Management.

## **3. Lecturing activity**

Assoc. Prof. Genoveva Zlateva has extensive experience in lecturing (nearly 30 years), and the disciplines in which she conducted classes for the period in which she worked at the Faculty of Medicine at MU-Sofia and continues to conduct classes at the Faculty of Medicine of Sofia University „St. Kliment Ohridski” are „Physics”, „Medical Equipment”, „Biophysics”, „Electrical Engineering” and „Biomechanics” for students in all medical specialties. The attached report on the workload for the last five years demonstrates that she has an average of

over 700 hours per year, which is well above the mandatory 360 hours of total employment for Sofia University.

#### **4. Administrative, expert and organizational activities**

For the period from 2009 to 2012 and from 2019 to the present, Assoc. Prof. Zlateva also holds the administrative position of Vice-Dean of the Faculty of Medicine. Her work is related to the organization of the educational process in the faculty. She was chairman of commissions for preparation of self-assessment reports on accreditation procedures in the Faculty of Medicine of Sofia University:

- Project for the opening of professional field „Health Care” with a degree in „Nurse” – 2010;
- Project for the opening of professional field Public Health – 2011;
- Program accreditation of the specialty „Medicine” in the Faculty of Medicine of Sofia University – 2010

Assoc. Prof. Zlateva is the author of reviews in scientific journals – Chinese Journal of Cancer Research, International Journal of Bioautomation, Journal of Experimental and Clinical Medicine, Yearbook of Sofia University „St. Kliment Ohridski” – Faculty of Physics, Bulgarian Journal of Physics. She also prepares reviews of research projects at the Research Fund of the Ministry of Education and Science and the Research Fund of Sofia University.

She has been a member and/or chairman of scientific juries for the awarding of educational and/or scientific degrees and for the acquisition of academic positions:

- Scientific Degree „Doctor of Science” – 1
- Educational Scientific Degree „Doctor” – 4
- Academic position „Associate Professor” – 3
- Academic position „Professor” – 2.

Assoc. Prof. Genoveva Zlateva was the leader of the project BG051PO001-3.3.06-0040 „Building interdisciplinary teams of young researchers in the field of basic and applied research relevant to medical practice” under the Operational Program „Human Resources Development”, under the scheme for a grant from the ESF „Support for the development of doctoral students, postdoctoral students, postgraduates and young scientists”, with a implementation period of 2013-2015 and a budget of over BGN 700,000. The target group of the project – 40 doctoral students, postdoctoral students and young scientists who have been supported with consumables for their scientific work, their presentation at a scientific and/or educational forum is funded, and they have visited the organized thematic trainings, seminars

and external courses.

## **5. Research activity**

### **5.1. Science-metric indicators and implementation of minimum national requirements (MNR)**

Assoc. Prof. Zlateva participates in 99 scientific publications, of which 38 in publications, referenced and indexed in the world-famous databases with scientific information Web of Science and Scopus and 61 in non-refereed journals with scientific review.

For the competition (apart from the scientific assets for the academic position „Associate Professor”) Assoc. Prof. Genoveva Zlateva has presented 19 publications in journals, referenced and indexed in the world-famous databases with scientific information Web of Science and Scopus, 30 publications in non-refereed journals with scientific review, 54 participations in scientific forums and 21 participations in scientific and educational projects.

In the reference submitted by Assoc. Prof. Zlateva, for the implementation of the MNR under Art. 2b of ZRASRB for scientific field 4. Natural sciences, mathematics and informatics, professional field 4.1. Physical sciences by indicators, all data for the quartiles (Q) of the journals on the metrics of Scopus (Scimago) and Web of Science (Journal Citation Report) are correctly reflected for the year of publication of the respective scientific publication. In addition, the applicant has provided data on the IF values of the journals (for the respective years), which is not required by the normative documents.

The categorization of the articles, according to the Regulations for application of ZRASRB, submitted for the competition is as follows: 4 publications with Q1, 4 publications with Q2, 4 publications with Q3, 5 publications with Q4 and two publications in journals without a quarter for the year of publication, but indexed in Scopus.

In category B of the report on the MNR, Assoc. Prof. Zlateva has selected publications that thematically correspond to the main scientific areas indicated in the report on the contributions in which she has worked and continues to work.

The total number of citations of all scientific papers of Assoc. Prof. Zlateva is 285. (Scopus, WoS and Google Scholar). 245 of the citations are after 2007, respectively after the acquisition of AP „Associate Professor”, and 185 of them in journals referred to in Web of Science and Scopus (worth 370 points), which significantly exceeds the requirements in category E.

Assoc. Prof. Genoveva Zlateva was the leader of a project under the Operational Program „Human Resources Development” and a participant in one under the OP „Science and

Education for Smart Growth”, as an academic mentor funded by the ESF. Participates in twelve research projects at the Research Fund at Sofia University „St. Kliment Ohridski”, leading six of them. It is worth noting that the research team of all projects includes students (mostly from the Faculty of Medicine), young scientists, PhD students and postdoctoral students. Genoveva Zlateva has also participated in two projects at the NSF of the Ministry of Education and Science and was the coordinator of a bilateral project between Sofia University „St. Kliment Ohridski”, Faculty of Medicine and the National Institute of Radiological Sciences of Japan.

From the summary presented in category E, it is evident that the total number of candidate’s points is 396, compared to the required 150 for Academic Degree „Professor”.

Group of indicators	Minimum national requirements	Candidate data
A	50	50
B	100	100
Г	200	212
Д	100	370
E	150	396

The total impact factor of the publications of Assoc. Prof. Zlateva is 50.80. The impact factor of those submitted for participation in the competition is 24.15. The Scopus H-index of the candidate, with excluded auto-citations is 7.

## 5.2. Contributions of the scientific works of the candidate

In the presented report on the contributions, Assoc. Prof. Zlateva has categorized her works in five main areas, as follows:

- **Use of redox modulators as cytotoxic agents in tumor cells alone or as means to increase sensitivity to conventional chemotherapeutics, as well as to reduce their side effects.**

The effect of  $\alpha$ -tocopheryl succinate on the redox status of leukemic and normal lymphocytes, as well as their sensitization to four conventional and eleven new generation anticancer drugs, was studied. The molecular mechanisms of action of  $\alpha$ -TS (in combination with anticancer drugs) based on the regulation of metabolic processes that are vital for leukemic lymphocytes are discussed in detail. Evidence has been obtained that  $\alpha$ -TS may be an adjunct to antitumor therapy, especially in acute lymphoblastic leukemia, to reduce the doses administered to conventional chemotherapeutics in order to minimize their side effects.

The effects of menadione/ascorbate M/A and temozolomide TMZ (chemotherapeutic standard

of care), on isolated glioblastoma cells and normal microglial cells, on cell survival and mitochondrial superoxide overproduction were also studied. The combination drug menadione/ascorbate (M/A) was found to have synergistic dose-dependent antiproliferative and cytotoxic effects on cancer cells, but not on normal cells of the same origin, especially at concentrations that can be reached *in vivo* through oral and parenteral application.

- **Optical image.**

*In vivo* experiments were performed to record fluorescence using quantum dot-labeled polymersomes (QD705 polymersomes) on colorectal cancer models. The high selectivity of accumulation of QD705-labeled polymersomes has been demonstrated. Comparative experiments on the effectiveness of labeling chitosan-based polymersomes with different fluorescent contrast agents – quantum dots (QD) and conventional organic dyes – have been described and performed. The data suggest that size-controlled long-circulating polymersomes are suitable fluorescent probes and nanosystems for the transfer of pharmaceuticals with great potential for *in vitro* and *in vivo* applications.

- **Methods and techniques for visualization of pathologies associated with alterations of cellular redox status.**

A two- set sensor system is described: (i) a sensor for total antioxidant (reducing) capacity and (ii) a sensor for the level of oxidative stress. The structure of both redox sensors is made up of small quantum dots (QDs) coated with nitroxide-functionalized cyclodextrin (paramagnetic or diamagnetic) conjugated to triphenylphosphonium groups. With the sample, total antioxidant (reducing) capacity and/or level of oxidative stress in biological objects can be monitored using EPR, MRI and fluorescent optical imaging. The study shows that sensors based on cell-penetrating contrast multimodal samples are suitable contrast probes and make it possible to assess separately the oxidative and reducing capacity of cells and the balance between oxidants and reducers *in vitro* and *in vivo*, using three techniques for registration – EPR, MRI and fluorescent image.

Renal dysfunction is visualized (caused by hypercholesterolemia) in mice based on redox imbalance and oxidative stress in renal tissues, using a hydrophobic nitroxide radical penetrating the cell membrane – mito-TEMPO. The dynamics of the MRI contrast of the nitroxide radical mito-TEMPO (reduction of the T1-relaxation time of water protons in MRI) in the renal cortex in the development of glomerulosclerosis and increase in the oxidative capacity of cells in this area, has been registered. The data suggest that hypercholesterolemia causes redox imbalance and oxidative stress in the kidneys, and this process can be visualized

using nitroxide-enhanced MRI, using mito-TEMPO as a redox-sensitive contrast probe to diagnose kidney damage.

In addition to the data from the above studies, an algorithm for extracting contrast-enhanced signals from magnetic resonance imaging (MRI) images is described in detail, using an ImageJ script, in order to objectively estimate the differences between kinetic curves by statistical methods and the ability to analyze the degree of functional impairments, based on changes in the redox status of the studied tissue and the dynamics of contrast.

- **Investigation of surface and interface polariton modes of optical phonons (SPP and IPP) in low-dimensional structures.**

Raman spectra of samples representing Si matrix with ion-implanted nanolayers and nano-inclusions from semiconductor silicides were studied. The energies of the interband transitions in the studied energy range were determined from studies of resonant Raman scattering.

The conditions for the appearance and observation of surface and interface phonon-polariton (SPP and IPP) modes in InN nanolayers deposited on a sapphire with AlN buffer were studied. Theoretical dispersion curves of IPP modes in the air/InN/AlN/sapphire system for different thickness of the InN layer were obtained.

Infrared (IR) and Raman spectroscopy were used to characterize various polymeric materials implanted with low-energy  $\text{Si}^+$  ions, and it was found that the implantation of  $\text{Si}^+$  in polymethyl methacrylate and polypropylene leads to the formation of amorphous and nanocrystalline graphite, mainly in polypropylene.

- **Issues of training students in medical specialties**

Analyzes of various forms and methods in the teaching of physics and other disciplines for students of medical specialties have been conducted. It is concluded that games in teaching methods, as well as other unconventional approaches, are applicable and successful in learning not only for younger students, but also for high school- and university students, if the created didactic games are age-appropriate. The use of innovations in education, aimed at learning in a non-traditional way, turns passive learning into an active creative process, which is an important topic of our time.

## **6. Personal impressions**

Assoc. Prof. Zlateva is dedicated, thorough and serious in her approach to solving problems scientist and colleague, highly valued and respected in the academic field.

## CONCLUSION

The scientific papers and materials submitted for the competition are in full compliance and exceed the required scientific indicators according to ZRASRB, the Regulations for application of ZRASRB and the Regulations on the terms and conditions for obtaining scientific degrees and holding academic positions at Sofia University „St. Kliment Ohridski”. They demonstrate that the candidate is a dedicated researcher, an experienced lecturer and an excellent administrator. Based on the above analysis and my personal impressions of the candidate as an established professional, I confidently give my positive assessment and recommend to the Scientific Jury to prepare a report-proposal to the Faculty Council of the Faculty of Medicine at Sofia University „St. Kliment Ohridski” for awarding the academic position „Professor”, in professional field 4.1. Physical Sciences (Medical Physics) of Assoc. Prof. Genoveva Antonova Zlateva, PhD.

Assoc. Prof. Plamen Georgiev Getsov, MD, PhD

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Sofia