

## STATEMENT

**From** Assoc. Prof. Dr. Adriana Gousterova, PhD  
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Professional field 4.3. Biological Sciences, specialty: Microbiology

**REGARDING:** Competition for the academic position "PROFESSOR", Professional field 4.3. Biological Sciences (Microbiology-Antibacterial effect of nanomaterials), announced in SG No. 103/12.12.2023 with candidate Assoc. Ph.D. Iliyana Atanasova Ivanova.

Pursuant to Art. 4 and Art. 29a of the Law on the Development of the Academic Staff in the Republic of Bulgaria, art. 60 et seq. from the Regulations for the implementation of the LDACRB, 118 para. (1) and para. (3) of the Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions in the SU "St. Kliment Ohridski" and the decision of the Faculty Council of the Faculty of Biology, protocol No. 3 of 30.01.2024, appointed a scientific jury to hold a competition for a professor in professional field 4.3. Biological Sciences (Microbiology-Antibacterial effect of nanomaterials), announced in SG No. 103/12.12.2023 with candidate Assoc. Ph.D. Iliyana Atanasova Ivanova.

As a member of this jury, I declare that I have no joint publications, projects or conflict of interest of any other nature within the meaning of para. 1 items 3 and 5 of the LDACRB with the only candidate evaluated in the competition - Associate Professor Dr. Iliyana Atanasova Ivanova from the "General and Industrial Microbiology" Department, Faculty of Biology. Sofia University (SU) "St. Kliment Ohridski".

The presented documents are in accordance to the directions published in the Regulations for application of the LDACRB.

### **1. BRIEF INFORMATION ABOUT THE CANDIDATES IN THE COMPETITION:**

Assoc. Prof. Dr. Iliyana Atanasova Ivanova is the only candidate in the competition for the academic position **PROFESSOR**, announced by the Sofia University "St. Kliment Ohridski" for the needs of the department "General and industrial microbiology" Faculty of Biology. Sofia University (SU) "St. Kliment Ohridski".

She graduated as a "Master of Biochemistry and Microbiology"; Faculty of Biology, Sofia University (SU) "St. Kliment Ohridski", (1981 - 1986) followed by regular doctoral studies" (1989-1994) Dissertation work for awarding the educational and scientific degree "doctor" **Microflora of the Tyulenovo oil field and possibilities for its practical application**, 18.3.1994 Faculty of Biology, SU.

"St. Kliment Ohridski". Dissertation defended before the Specialized Scientific Council for Microbiology at the VAK, diploma No. 23088 dated 25.05.1994.

Assoc. Dr. Iliyana Atanasova Ivanova held the following academic positions: assistant from 25.02.1997 to 19.01.1999; senior assistant from 19.01.1999 to 27.06.2002; chief assistant, effective from 27.06.2002 to 17.11.2014; associate professor effective from 17.11.2014 and continues to work in the Department of General and Industrial Microbiology, Faculty of Biology.

### **2. FULFILLMENT OF THE REQUIREMENTS FOR THE ACADEMIC POSITION OF "PROFESSOR"**

The only candidate for the academic position of "Professor" under the competition submits a Reference on the fulfillment of the national requirements of the Act on individual indicators and a Reference on the fulfillment of the additional requirements for occupying the

position of "Professor", according to the Regulations with a list of general publications included in it, submitted for participation in the competition for "PROFESSOR". Total 23 articles, 17 of them in journals with IF or SJR, referenced in Scopus or Web of Science, Publications without IF - 6.

Book chapters were also published - 1 issue.

A monograph has also been published - 1 issue; "Biological Effects of Nanomaterials" University Publishing House "St. Kliment Ohridski" 2023, 204 pages.

They are issued and published 1 issue of University textbook "Ecotoxicology and nanotechnologies" 2018, University Publishing House "St. Kliment Ohridski", 324 pages. Author ID (SCOPUS)

Publications attached to the competition with ( Q)-16 scientific publications and 1 book chapters C ( Q1) – 1, C( Q2 )– 7, C( Q3) – 8, C( Q4 )–1

Scientific supervisor of 1 doctoral candidate and 1 in the process of training.

Successfully defended diploma graduates in total 24 in a period of (1997-2023) as bachelors -7; masters 17

Impact factor: total 31.61, impact factor for the competition period: 26.09

Citations: Total 168 and after the habilitation for associate professor in 2014 – 140

- 168 in publications referenced in Scopus and Web of Science

- 36 other databases

**H-index: 8 (Scopus), SJR-6.071, ( Web of Science ) -7**

**Participation in scientific conferences after the habilitation in 2014.**

International and with international participation: Total 22 participations with reports and posters  
- National: 11 posters and reports presented

Participation and management of scientific and educational projects:

**I. Projects financed specifically from the state budget**

A total of 5 projects - manager of 3 and participant in 2 projects II.

**II. Projects financed under operational programmes:**

BG05M2OP001-2.09-0013 Doctoral Center "St. Kliment Ohridski", OP Science and Education for Intelligent Growth 2017 - 2019, head of doctoral course "Nanomaterials and interactions with cells"

**III. Projects financed by the "Scientific Research" fund at the Ministry of Education and Culture:**

A total of 7 projects, as a participant.

Associate Professor Dr. Iliyana Atanasova Ivanova was an academic mentor in the following projects of the Ministry of Education and Science, financed by the from Operational Program "Science and Education for Smart Growth":

- BG05M2OP001-2.002-0001 "Student practices"-phase 1 (2017-2020)

- BG05M2OP001-2.013-0001 "Student practices"-phase 11 (2020-2023)

**3. FULFI LDACRB.LLEMENT OF MINIMUM NATIONAL REQUIREMENTS ACCORDING TO LDACRB.**

It is clear from the competition documents that Assoc. Dr. Iliyana Atanasova Ivanova meets and exceeds the minimum national requirements as follows:

**Indicator group A – 50 points**

The candidate received the educational and scientific degree "Doctor" on 25.05.1994

**Indicator group 4 in Group B – 100 points**

Habilitation thesis - scientific publications in international journals that are referenced and indexed in world-renowned databases of scientific information Scopus and Web of Science in the period - 2023, "Biological effects of nanomaterials" University Publishing House "St. Kliment Ohridski" 224 p.

**Group of indicators 7 and 8 in group G - 267 points**

Scientific publications in international journals that are referenced and indexed in world-renowned scientific information databases Scopus and Web of Science in the period 2018-2024 - 16 scientific articles with IF ( Q2-7; Q3 -8-; Q4-1; ) and published book chapter or collective monograph (Q3).

**Group of indicator 11 in group D - 330t.**

Citations: for the contest period:

- **168 in publications referenced in Scopus and Web of Science:**
- **36 In journals not referenced in global databases (with reviewers)**

**H-index:** 8 (Scopus) and **SJR-6.071**, (Web of Science) -7

**Group of indicator E - 175 points**

doctoral students: 1 defended 25 points and 1 is in the process of studying, graduate students: 24 successfully defended, 7 of them are bachelors and 17 masters in the period from 1997-2023.

**Indicator E 14** - participation in a national scientific or educational project - **30 points** - 3 Contracts.

**Participation in an international research project with national co-financing 4 projects 80t.**

Co-supervisor of a successfully defended doctoral student **25 pts.**

**Indicator E 19. Published university textbook or textbook that is used in the school network** - textbook 40t.

The scientific works of Assoc. Dr. Iliyana Atanasova Ivanova completely cover the topic of the current competition.

The main contributions of the activity of Assoc. Dr. Iliyana Atanasova Ivanova are presented in a summary of 17 pages giving well systematized information about the performed scientific activity. The contributions from the publications are grouped into 3 main scientific research directions fully corresponding with the direction of the competition and the unit, as follows;

**Study of antimicrobial effect of newly synthesized nanomaterials and nanocomposites**

***Habilitation certifica***

The main contributions of the monograph are related to the in-depth analysis of the data published so far regarding the physico-chemical and molecular mechanisms for the implementation of the antimicrobial activity of nanomaterials, the establishment of specific mechanisms of toxicity and gene expression and reactions of the affected pathogens related to the change in the conditions of the environment and they can be generally systematized in the following directions:

- **study of antimicrobial effect of newly synthesized nanomaterials and nanocomposites**
- **prevention of microbial adhesion and biofilm formation**
- **creation of biologically active thin films with antimicrobial action**
- The contribution is of a fundamental scientific nature and is original, since for the first time it shows clarification of the mechanisms of action of hydrophobic nanomaterials on living cells

- The research found that the addition of copper nanoparticles to silver-titanium thin films had a stronger antimicrobial effect, and the most pronounced bactericidal effect was obtained with titanium, silica and silver thin films. This is a significant contribution to the preparation of coatings for medical devices, antibacterial surfaces and hospital clothing to reduce the spread of nosocomial infections
- Organic nanocomposites are also discussed in the monograph. Collagen as a natural product with excellent biocompatibility, bioresorbability and hemostatic activity is one of the most commonly used biomaterials in tissue engineering
- In the monograph, interdisciplinary research is considered and in the conclusion it is proposed to create a common coordination network uniting different specialists in determining the safety of nanomaterials

#### **RESEARCH OF MONOMETALLIC, METAL OXIDE AND NONMETALLIC NEWLY SYNTHESIZED NANOMATERIALS WITH ANTIMICROBIAL ACTIVITY**

- It was found that the most cytotoxic for the tested bacteria were silver, copper, zinc-oxide, niobium, SeNPs, followed by Au-PVP and AuNPs. Graphene-oxide NPs also showed a stand-alone cytotoxic effect, especially on *B. cereus* NBPMKK1095. A comparative assessment of the antibacterial effect of commercial nanoparticles (selenium, gold, iron oxide, silicon oxide and graphene oxide) in the form of dispersions was made

#### **PREVENTION OF MICROBIAL ADHESION AND BIOFILM FORMATION**

- The antibacterial properties of collagen nanocomposites related to graphene, graphene oxide, (GO), zinc-oxide and metal nanoparticles were investigated and their pro-, antioxidant and biological activity was evaluated by luminescent and standard microbiological methods
- The broad-spectrum antimicrobial activity against Firmicutes (*Staphylococcus epidermidis*, *Bacillus cereus* and *Candida lusitanae*) and Gracilicutes (*Escherichia coli*, *Salmonella enterica* and *Pseudomonas putida*) microorganisms has been proven

In the conducted collective studies of the biological and antioxidant activity of newly synthesized nanoparticles, nanoclusters and nanocomposites, **the following theoretical and methodological contributions of the candidate can be summarized:**

A comparative assessment of the antibacterial effect of newly synthesized nanocomposites of reduced graphene oxide and its combinations with silver and copper was made. The key role of the size and shape of the nanoparticles for the effectiveness of their inhibitory and bactericidal effect has been confirmed. A synergistic effect of copper and silver nanoparticles in combined nanocomposites based on ecosystem functions and ecosystem services has been established.

An important contribution in anti-adhesive coatings is the pioneering study of antioxidant-containing coatings and their action against biofilms. The use of antioxidants in protective coatings to inhibit marine biofilm formation has been unexplored to date.

#### **CREATION OF BIOLOGICALLY ACTIVE THIN FILMS WITH ANTIMICROBIAL ACTIVITY**

It is used in the production of antimicrobial film in hospitals, public institutions, in the food and pharmaceutical industries.

#### **5. Educational and methodological activity**

The submitted documents for the competition prove the active and long-term teaching activity of Associate Professor Dr. Iliyana Atanasova Ivanova since 1997 as a chief assistant and since 2014 as an associate professor. Until now in the Department of General and Industrial Microbiology.

During the period from 2014 8 lecture courses have been developed, such as 4 for bachelors, 3 courses for masters and 1 for doctoral students. For the needs of the "General and Industrial Microbiology" department, Assoc. Dr. Iliyana Atanasova Ivanova led the following lecture courses and exercises on the given specialties;

#### **BACHELOR**

- "General microbiology with virology" for binary majors, lectures and exercises.
- "Biology" part-time study, lectures, in Microbiology
- "Biotechnology" exercises, in Microbiology
- "Biomangement and sustainable development" lectures and exercises optional on bioethics
- BMUR; "Ecotoxicity tests for environmental control", lectures and exercises optional.

#### **MASTER**

- "Microbiology and microbiological control", - lectures Sanitary microbiology mandatory
- "Quality and safety of food", - lectures on Physico-chemical and biochemical control of food, compulsory exercises
- **Correspondence training** - lectures on Physico-chemical and biochemical food control, and mandatory exercises.

**Postgraduate qualification** "Cellular interactions with nanomaterials" at the Faculty of Arts "St. Kliment Ohridski" 2017.

Doctoral course "Nanomaterials and interactions with cells", approved by FS-BF 27.02. 2018 and conducted second semester 2018. During the period of his long-term teaching activity, Assoc. Dr. Iliyana Atanasova Ivanova at the Department of "General and Industrial Microbiology" The Faculty of Biology has prepared graduates from bachelor's and master's programs, supervised doctoral students who have successfully defended and are in the process of preparation.

#### **6. Personal impressions of the candidate**

I know Associate Professor Dr. Iliyana Atanasova Ivanova from my many visits to the Faculty of Biology, SU "St. Kliment Ohridski" from my student years and from my many years of teaching in the department. I have excellent impressions of her research activities, of the energy she puts into her work, of her scientific knowledge in the field of microbiology, biotechnology, and molecular biology.

I am convinced that these qualities will be very useful to her as a professor in the Department of General and Industrial Microbiology, Faculty of Biology.

#### **7. Critical notes and recommendations**

I have no comments or recommendations for the candidate. All documents are prepared as required.

#### **CONCLUSION**

Assoc. Dr. Iliyana Atanasova Ivanova is an established and promising scientist in the field of the current competition (Microbiology-Antibacterial effect of nanomaterials). In her scientific career, she has grown as a researcher with excellent knowledge of the problems she is working on.

Actively participates in the development of bachelor's and master's programs, in national and international projects, personnel training. Formulated scientific and applied contributions contribute to increasing knowledge in microbiology, biotechnology, molecular biology. A university textbook for students has been published.

**The lists and references submitted for the competition satisfy the criteria for occupying the academic position "Professor".**

**Based on the analysis, I confidently give my positive assessment and recommend to the members of the honorable scientific jury to fully support the occupation of the academic position "PROFESSOR" in the field of higher education in professional direction 4.3. Biological Sciences (Microbiology-Antibacterial effect of nanomaterials), Sofia University (SU) "St. Kliment Ohridski" to the candidate Assoc. Ph.D. Iliana Atanasova Ivanova.**

**Date 15.03.2024**

**Assoc. Dr. Adriana Guscherova**