СОФИЙСКИ УНИВЕРСИТЕТ
„СВ. КЛИМЕНТ ОХРИДСКИ“

FACULTY OF BIOLOGY
SOFIA UNIVERSITY

STATEMENT

by Assoc. Prof. Anna Atanasova Tomova, PhD
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Regarding: competition for the academic position „Associate Professor“ in the Higher Education area 4. Natural Sciences, Mathematics and Informatics; Professional area 4.3. Biological Sciences; Scientific specialty Microbiology

1. Information about the competition

The competition for the academic position „Associate Professor“ has been announced in the State Gazette, issue № 30, dated April 8, 2025, for the needs of the Department „General Microbiology“, Laboratory „Extremophilic Microorganisms“ at the Stefan Angeloff Institute of Microbiology – Bulgarian Academy of Sciences (IMIC-BAS). The sole candidate is Dr. Ivanka Petrova Boyadzhieva, who currently holds the position of Chief Assistant in the same department and laboratory. By order No. I-77 dated May 28, 2025, issued by the Director of the Institute of Microbiology, I was appointed as a member of the Scientific Jury for the competition. As a member of the jury, I hereby declare that I have no joint publications with the candidate.

2. Brief presentation of the candidate in the competition

Dr. Ivanka Boyadzhieva graduated with a Master's degree in Molecular Biology in 1999 from Sofia University "St. Kliment Ohridski". In 2000, she began her professional career as a microbiologist at the Institute of Microbiology of the Bulgarian Academy of Sciences (IMIC-BAS), where she has continued to develop her academic career and remains employed to this day.

At the laboratory "Extremophilic Microorganisms", she has successively held the positions of Assistant and Chief Assistant. In 2011, she defended her Ph.D. thesis entitled "Biosynthesis and properties of superoxide dismutase from thermophilic bacteria isolated from Bulgarian hot springs," acquiring the educational and scientific degree „Doctor“ in Microbiology.

Since 2023, she has been the head of the "Extremophilic Microorganisms" laboratory.

Dr. Boyadzhieva is the co-author of 31 scientific publications. For the current competition, she has submitted 20 scientific articles, 3 book chapters, and 1 patent for review, all published between 2002 and 2025. The publications included in her Ph.D. dissertation are not part of the submitted materials. Dr. Boyadzhieva has participated in the implementation of nine research projects – three national and six international, being the leader of one of them. The results of her scientific work have been presented at 11 scientific conferences.

3. Fulfillment of the requirements for holding the academic position of Associate Professor

The materials submitted for the competition comply with the Act on Development of the Academic Staff in the Republic of Bulgaria (ZRACRB) and the Regulations for its implementation, as well as with the Rules of the BAS and the Rules of the Institute of Microbiology regarding participation in academic competitions. A comparison of Dr. Ivanka Boyadzhieva's scientometric indicators with the Minimum Requirements for Associate Professor as defined in ZRACRB and the BAS Rules for field 4: Natural Sciences, Mathematics and Informatics, professional direction 4.3. Biological Sciences, yields the following results based on the individual criteria:

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Group of Indicators	Content	Requirements for Associate Professor	Assist. Prof. Dr. Ivanka Boyadzhieva
A	Indicator 1	50	**50**
B	Indicator 2	-	-
C	Indicators 3 and 4	100	**100**
D	Sum of Indicators from 5 to 9	220	**340**
E	Sum of Indicators from 10 to 12	60	**326**
F	Sum of Indicators from 13 to the end	-	**-**

Out of the 20 scientific publications in peer-reviewed and indexed journals, 19 appear in journals with an impact factor (IF) and one article is published in full text in the proceedings of an international scientific forum.

The total impact factor of Dr. Boyadzhieva's publications is 42.694, and her h-index is 10 (according to Scopus).

Five of the scientific articles are submitted as habilitation work (indicator 'C') and are

published in Q2-ranked journals. Under indicator 'D', 15 publications are included - 3 in Q1, 6 in Q2, and 5 in Q3 journals, along with three book chapters and one patent. Dr. Boyadzhieva's research has been published in prestigious international journals - *Microorganisms, Applied Microbiology and Biotechnology, Archaea, and Extremophiles*.

The scientific papers for participation in the competition have been cited 163 times in Scopus (excluding self-citations), which corresponds to 326 points on index 'E' – significantly above the required 50/60 points stipulated in the ZRASRB and BAS regulations.

The total number of points accumulated by the candidate across all evaluation criteria is 816, significantly exceeding the required minimum of 430.

Conclusion on point 3: The documentation submitted by Dr. Boyadzhieva certifies that she fully meets the minimum national requirements for holding the academic position of 'Associate Professor', according to ZRASRB and the Regulations of BAS, significantly exceeding the regulatory indicators for groups D and E, and there are no unmet requirements.

4. Fulfillment of additional criteria for „Associate Professor“ at IMIC-BAS.

The candidate meets all additional requirements specified in the Regulations of IMIC-BAS. Dr. Ivanka Boyadzhieva has held the academic position of „Chief assistant“ for 10 years. The publications submitted as habilitation work do not overlap with those used for obtaining the academic degree 'Doctor'.

In six of her scientific publications, she is listed as either the first or corresponding author. She has accumulated a total of 218 citations, exceeding the required minimum of 100; her impact factor is 42.694, more than double the required 20; and her h-index is 10, surpassing the minimum requirement of 5. Dr. Boyadzhieva has participated in nine research projects, three national and six international, compared to the minimum requirement of three.

Conclusion on point 4: The candidate, Dr. Ivanka Boyadzhieva, meets the additional requirements of the Institute of Microbiology, BAS.

5. Summary characteristics of scientific work and contributions.

Dr. Boyadzhieva's research is in full accordance with the thematic focus of the laboratory she leads, making a substantial contribution to the advancement of its core scientific directions. Her work encompasses four main areas of research: 1. Biodiversity of microbial communities in extreme environments; 2. Biosynthetic potential of extremophiles isolated from Bulgarian extreme niches; 3.

Microbial enzymes and exopolysaccharides of biotechnological relevance; 4. Research in other scientific directions.

The candidate`s scientific contributions are primarily focused on the biodiversity of both culturable and non-culturable microorganisms inhabiting extreme ecological niches in Bulgaria. Her research also focuses on analysing the genetic potential of these microorganisms for the synthesis of biologically active compounds, including enzymes, exopolysaccharides, and antimicrobial compounds.

The study of extremophilic microorganisms and their habitats holds particular significance for modern science, offering valuable opportunities to:

• Discover novel microbial species, thus enriching knowledge about microbial biodiversity;

• Exploring primitive life forms on Earth and assessing the potential existence of life on other planets;

• Identify unique metabolic genes with high relevance and applicability in modern biotechnological processes.

Main scientific contributions:

- ✓ An in-depth metagenomic study on the taxonomic affiliation and functional capacity of bacterial and archaeal communities from various extreme habitats in Bulgaria has been conducted - basin P18 of the Pomorie saltworks and geothermal springs from Southwestern and Central Bulgaria;
- ✓ Through molecular and microbiological analyses, the diversity and biosynthetic potential of culturable halophilic bacteria from the saltworks in Pomorie, Burgas, and the rock salt deposit in Mirovo (city of Provadia) have been investigated, focusing on the biosynthesis of enzymes, exopolysaccharides, and antimicrobial compounds.
- ✓ Extracellular enzymes and exopolysaccharides have been isolated, purified, and characterized from extremophilic bacteria - haloalkaliphilic pectinase from *Virgibacillus salaries* 434, thermostable pectinase from *Anoxybacillus gonensis* 357, thermostable nitrilases and cyclodextrin transferases from thermophilic and alkaliphilic *Bacillus* species, a phytase from the halophilic bacterium *Cobetia marina* 439; thermostable lipase from *Brevibacillus thermoruber* 7, active on Ɛ-polycaprolacton; exopolysaccharide from *Chromohalobacter canadensis* 28.
- ✓ A thermophilic community has been isolated from a hot spring in Marikostinovo, capable of degrading polycaprolactone (PCL) at the highest reported degradation temperatures for PCL so far - 55°C.
- ✓ For the first time, a halophilic bacterial community has been isolated from a plastic-contaminated area in Burgas Lake that degrades PCL, polystyrene (PS) and polypropylene (PP).
- ✓ Through cultivation-independent analyses, the intestinal microbiota of five species of lizards cohabiting in the same low mountain area in Western Bulgaria have been studied.
- ✓ Bacterial nano-cellulose has been obtained through fermentation with a symbiotic culture of bacteria and yeast isolated from kombucha, and its applicability in supercapacitor cells has been investigated.

Main scientific and applied contributions:

- ✓ A combined methodological approach has been applied to assess the biodiversity of microbial populations, incorporating the analysis of genes encoding specific enzymes - hydrolases, nucleases, lipases, and chitinase. This strategy enables the accumulation of valuable data regarding the biotechnological potential of both culturable and non-culturable microorganisms.
- ✓ The potential of culturable extremophilic (thermophilic and halophilic) bacteria as promising producers of enzymes, exopolysaccharides, and antimicrobial compounds has been proven.
- ✓ Efficient technological methodologies have been developed for the purification and characterisation of bioactive molecules from extremophilic bacteria, enabling the production of biologically active substances in high yields while preserving their biological activity.
- ✓ The optimal conditions for cultivating the halophilic bacterium *Chromohalobacter canadensis* 28 have been established, resulting in an increase in EPS production to 3.085 mg/ml.
- ✓ The biotechnological potential of the exopolymers from thermophilic and halophilic bacteria, isolated from Bulgarian extreme niches, has been proven.
- ✓ The effectiveness of the thermostable lipase from *Brevibacillus thermoruber* 7 in degrading plastic has been demonstrated, making the enzyme highly suitable for applications related to recycling and degradation of plastic waste at temperatures close to the melting point of the polymer.
- ✓ Hybrid sol-gel matrices have been developed based on tetraethoxysilane and various organic components, which have been proven to be suitable carriers for the immobilization of microbial cells.

CONCLUSION

Based on the analysis of the content and quality of the materials submitted for the competition, I conclude that the candidate, Assoc. Prof. Dr. Ivanka Boyadzhieva fully meets the requirements for the academic position of „Associate Professor“ established in the ZRASRB, the Regulations of BAS, and the Regulations of Stephan Angeloff Institute of Microbiology-BAS.

Her scientific work represents a significant contribution in the field of extremophilic microorganisms, a research area in which she intends to continue her future investigations.

Based on the above statement, I give a positive evaluation and recommend that the Scientific Jury support her candidacy and propose to the Scientific Council of IMIC-BAS that Dr. Ivanka Boyadzhieva be appointed to the academic position „Associate Professor“ in the scientific specialty „Microbiology“ for the needs of the laboratory „Extremophilic Microorganisms“.

08.08.2025 г. Prepared by: .....

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