

## OPINION

Prepared by Prof. Dr. Lyudmila Vladimirova Kabaivanova - Milanova, Institute of Microbiology "Stephan Angeloff" - BAS, elected as a member of the Scientific Jury and reviewer, on the basis of order No. RD-38-548-2023 of the Rector of SU "St. Kliment Ohridski" prof. Anastas Gerdzhikov, DSc according to the decision of the Faculty Council of the Faculty of Biology, protocol No. 13 of 12.09.2023 on the materials submitted for participation in the competition for the academic position of "Associate Professor" in professional direction 4.3 Biological Sciences (Hydrobiology - water management), published in the State Gazette number 67 of 08/04/2023.

Candidate: Assistant Prof. Dr. Ivaylo Dimitrov Yotinov

### **Common part**

In the competition for acquiring the academic position "Assoc. Prof." in professional direction 4.3 Biological sciences (Hydrobiology - water management), announced in the State Gazette number 67 of 08/04/2023, the only candidate is Assistant Prof. Dr. Ivaylo Dimitrov Yotinov. The review of the documents shows that the procedure for disclosure and announcement of the competition has been followed. The presented set of materials has also been prepared in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB) and the regulations for its application, as well as the regulations on the terms and conditions for acquiring scientific degrees and holding academic positions at SU "St. Kliment Ohridski".

### **Brief biographical data**

Ivaylo Dimitrov Yotinov received his master's degree at the University of "St. Kliment Ohridski", Faculty of Biology as "Master of Environmental Biotechnology" in 2012. The candidate received the ESD "Doctor" in the Faculty of Biology - doctor in professional direction 4.3 Biological Sciences (Biological Water Treatment) in 04.2016. From 04.2018 - until now he is a participant in the Competence Center "Clean Technologies for a Sustainable

Environment - Water, Waste, Energy for a Circular Economy", funded by the Operational Program "Science and Education for Smart Growth at Sofia University "St. Kliment Ohridski", where he currently holds the position " Assistant Prof.".

### **General presentation of scientific works**

Dr. Yotinov participated in the competition with **17 publications, 1 useful model and 44 citations**. According to the submitted report on the fulfillment of the minimum requirements for the academic position "Associate Professor" (NATIONAL CRITERIA UNDER LDASRB for the relevant professional field), it can be seen that the candidate meets all the requirements - he submitted materials corresponding to **472 points** out of the required **400**. In the groups of indicators, respectively: **A – 50 points; C – 105 points; D – 229; D - 88**.

The scientific activity of Assistant Prof. Yotinov is closely related to the topic developed by the unit in which he works, and it is extremely current, concerning the problems of environmental protection. His works have been presented at **76 scientific forums**, which speaks of the significance of the obtained scientific results.

Ivaylo Yotinov has also been honored with numerous prestigious scientific awards.

### **Project and teaching activity**

Dr. Yotinov's project and teaching activities are significant. It should be noted that he has considerable experience in teaching activities as a holder of the Bachelor's degrees programs "Biomangement and sustainable development" and "Ecology and environmental protection" - full-time and part-time studies, lecture courses for the Master's program - "Biobusiness and bioentrepreneurship" and "Environmental Biotechnology". He took part in the implementation of **32 projects** and was the head of **18**. Ivaylo Yotinov's contribution to the project activity is a strong point in his scientific biography.

As a thesis supervisor, the candidate has **18 graduate students**.

### **Expert and administrative activity**

Ivaylo Yotinov was a reviewer of 22 diploma theses, which distinguishes him as an expert in his field.

His administrative commitment is expressed in the following activities: Head of the Master's Program in "Biobusiness and Bioentrepreneurship" from 02.2018 - until now; Administrative Secretary of the Management Board of the Competence Center "Clean technologies for a sustainable environment - water, waste, energy for a circular economy" from 10.2018 - until now; Member of the Commission on Proposals for Faculty Management Bodies, from 06.2020 to the present; Member of the Working Group of the specialty "Biomangement and Sustainable Development" - from 2019 - until now; Member of the Faculty Council of the Faculty of Biology at SU "St. Kl. Ohridski", (quota of Assist. Prof.) from 07.2020 - until now; Member of the Academic Council of SU "St. Cl. Ohridski", (quota of doctoral students) from 04.2014 - 11.2015; Member of the Faculty Council of the Faculty of Biology at SU "St. Cl. Ohridski", (PhD student quota) from 06.2014 – 01.2016; Member of the Student Council of SU "St. Cl. Ohridski", (quota of doctoral students) 12.2013 - 11.2015; Chairman of the Faculty Student Council of the Faculty of Biology 10.2009 - 10.2010; Member of the Student Council of SU "St. Cl. Ohridski", (student quota) 10.2008 - 10.2009; Co-founder of the Alumni Club of the Master's Program "Environmental Biotechnology" - 2015 – at present.

### **Scientific contributions**

The main contributions from the research activity of Dr. Yotinov can be considered in the following aspects: Maintaining good ecological conditions and water quality in natural and artificial water bodies for the generation of green energy and their incorporation into natural reservoirs with a working ecological superstructure; Embedding treatment plants in the environment and urban environment with maximum consideration of biotechnological and ecological requirements, control and management of parameters for ecological and biotechnological efficiency and effectiveness; Providing users with sufficient water of high quality while taking into account economic and environmental parameters through rational algorithms, methods, indicators and strategies for circular management of critical moments



in water cycles in order to distinguish critical control points and select workable means of control.

More important contributions:

❖ The key indicators for control and management of purification processes in biobasins of wastewater and leachate treatment plants were classified.

- A control system of hydrobiological, microbiological, hydrochemical, enzymological and molecular genetic indicators was used, which exceeded the standard indicators in treatment plants and significantly had a positive impact on water management in technological treatment facilities;
- Highly selective indicator connections have been selected to improve the control system in terms of efficiency, speed and efficacy, but also a deep understanding of the mechanisms of water purification processes;
- The relationships of micro- and metafauna with bacteria in activated sludge in biobasins and batch reactors have been investigated and their role in adaptive changes has been confirmed, as a key indicator for fine control and management of treatment processes, also in model conditions for biodegradation of xenobiotics;
- By applying enzymological indicators and molecular genetic analyzes /fluorescence in-situ hybridization - FISH/ as a key indicator for researching the hidden potential of non-cultivable microorganisms in the management of water treatment processes, the biodegradation and biodegradation abilities of microorganisms in the activated sludge are clarified.

❖ Critical factors for assessment and control of sediment zone self-purification in natural and engineered ecosystems were identified

- Monitoring studies of sediment microbial communities and their functional activity were carried out in order to determine key risk problems and to identify indicators and indicator links for express control;
- The risk events are modeled with diagnostics of the potential for biodegradation in the microbial sediment communities;

- Innovative augmentation factors of biodegradation processes - nanodiamonds and nanotubes have been applied;
  - Control algorithms and strategies for biomanagement of risk events in cascade sediments were constructed.
- ❖ Assessment, control and biomanagement of river ecosystems that are used for renewable energy extraction have been carried out.
- Functional approaches are proposed for studying and controlling microbial communities in anaerobic facilities in sewage treatment plants;
  - The synergism and syntrophy of methanogenic communities generating energy from biomass - green energy in the circular economy was examined;
  - Water management is shown in its interconnectedness-interaction-complexity-consideration of critical and key moments, against the background of the whole picture;
  - A bioindicator system was built for the management of methanogenic processes for control in anaerobic facilities in wastewater treatment plants.
- ❖ Innovative elements are applied for functional control and management of key processes of the water cycles.
- Correlations between key parameters in the control of the self-purification potential in waters and sediments were derived;
  - In model conditions, as close as possible to real ones, the processes of self-purification in dam sediments, contaminated simultaneously with trivial pollutants and xenobiotics, were modeled;
  - Functional application of bioaugmentation factors /microbial cultures/ for adaptation of activated sludge during biodegradation with shock pollution with xenobiotic /amaranth dye/ was carried out;
  - It has been proven that the adaptation mechanisms of activated sludge to shock loads with xenobiotics are complex and their regulation is directly related to the relationships between the bacterial segment and the micro- and meta-fauna segments;

- It has been shown that nanodiamonds as nano-level regulators have a great potential for precise and fine-tuning on the biodegradation of phenol and hypotheses have been proposed for the mechanisms of the augmenting effect of nanodiamonds on the biodegradation of toxic aryl-containing xenobiotics;
- Inactivation of Gram-positive and Gram-negative bacteria in suspension has been established when applying plasma sources, as means of eliminating hazardous pollutants and microbial water disinfection.

The studies and experimental work carried out and the aspects of water management considered show their important place in biotechnological entrepreneurship. The aim is to maintain the good ecological conditions and quality of water in natural and artificial reservoirs, generate green energy, embed treatment plants in the environment and urban environment with maximum consideration of biotechnological and ecological requirements, control and management of parameters for ecological and biotechnological efficiency and efficacy.

#### **CONCLUSION:**

The obtained results, reflected in the publications presented are original, up-to-date and of public importance. They reveal opportunities and perspectives for new research on current problems aimed at increasing the efficiency of water purification processes in general and their difficult-to-manage detoxification elements for a cleaner environment and increasing the quality of life of people. In his research work, the candidate applies a wide range and skillful combination of conventional and modern experimental approaches with a practical focus to propose rational algorithms, methods, indicators and strategies for circular management of critical moments in water cycles. From everything, said so far, it can be seen that the candidate is an established specialist enjoying authority in scientific circles.

The documents and materials presented by Assist. Prof. Yotinov meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Application and the Regulations for the Development of the Academic Staff of SU "St. Kliment Ohridski" to acquire the academic position of "Associate



Professor". This gives me a reason to confidently express my positive opinion regarding the submitted application for the academic position of "Associate Professor".

As a member of the Scientific Jury for the announced competition, I give a positive assessment and recommend to the members of the respected Faculty Council of the BF of SU "St. Kliment Ohridski", to elect Assist. Prof. Dr. Ivaylo Dimitrov Yotinov to the academic position of "Associate Professor" in professional direction 4.3 Biological sciences (Hydrobiology - water management).

27.10.2023 г.



/Prof. Dr. Lyudmila Kabaivanova/