OPINION

On the competition for the occupation of the academic position "Professor" in professional direction 4.2. "Chemical Sciences", specialty "Processes and Apparatus in Chemical and Biochemical Technology" at the Institute of Chemical Engineering - BAS, announced in State Gazette No. 66 of August 16, 2022

With a single candidate, Assoc. Prof. Dr. Maxim Ivanov Boyanov

By Elisaveta Hristova Ivanova, Professor, DSc, retired from the Institute of General and Inorganic Chemistry - BAS, member of the Scientific Jury

1. General characteristics of the candidate's scientific research, expert and pedagogical activities.

• The candidate's research work is in the field of molecular biogeochemistry, which aims to describe the factors influencing the movement of elements in nature. The object of study are the processes that affect the separation of pollutant ions from solution at the molecular level, such as formation of different kinds of complexes, redox mechanisms due to the anaerobic metabolism of microbes in subsoil environments, biosorption of toxic elements with a view to the possibilities for bioremediation. Modern spectroscopic techniques such as synchrotron X-ray spectroscopy (XANES, EXAFS), FTIR, NMR and Mössbauer were used by the candidate to determine the structure and dynamics of the ions, thus providing information on the binding of the target elements to the ligands present in the system. The total number of scientific publications of the candidate is 80 in peer-reviewed international scientific journals, of which 72 are in journals with an impact factor, IF: 1.5 - 30.1.

Activities after being elected Associate Professor:

• Leader of 4 international projects, three of which were successfully completed and one ongoing.

• Supervisor of two PhD students and one postgraduate at Argonne National Laboratory, USA.

• Lecture courses at the Faculty of Physics of Sofia University on: Radiochemistry, Experimental methods in physics (optical microscopy), Surface phenomena in dispersed systems.

• Expert activities: Author of 49 reviews for international scientific journals.

• Organizational activities: Organizer and Chairman of three conference sessions in the field of biogeochemistry.

2. Evaluation of the presented materials

For the competition the candidate has presented 1 book chapter and 25 scientific papers in renown scientific journals with impact factor, of which 17 are in quartile Q1, 1 in Q2, 1 in Q3 and 5 in Q4. The h-index of the candidate - 34 - is impressive. All quantitative indicators and criteria for occupying the academic position "Professor", according to the national minimum requirements, the Regulations for the terms and conditions for occupying academic positions at the BAS and the

Methodology for the growth of scientists in IChE-BAS, are satisfied. The materials are precisely prepared.

3. Basic scientific and applied scientific contributions

I accept the summary-self-assessment of the candidate for the contributions (scientific and applied scientific) in the presented scientific works. The main contributions may be defined as enrichment of existing experimental and theoretical knowledge and consist in the elucidation of reaction mechanisms in natural and laboratory environments, which are relevant to the fundamental understanding of processes taking place at the interface solution-mineral or solution-biological surface. The research contributes to the development of improved transport models that use specific reactions to model the spread of pollutants in real subsurface environments. Functional groups on biological surfaces have been found to significantly affect the adsorption of dissolved polyvalent metals, which defines an essential impact of bacteria on the movement of pollutants, and allows the use of biomass for water purification. Further contributions in this area consist in provision of information on the interactions at the molecular level between dissolved ions and surfaces, on the factors leading to the formation of nanoparticles and minerals, on the redox transformations of a variety of target elements from the point of view of environmental pollution.

• The significance of Dr. Boyanov's research for science and practice is determined by his contributions to the clarification of reaction mechanisms that are important in the development of engineering methods for decontaminating soils and waters from pollutants. For example, one of the main trends in the candidate's scientific work, which continues to this day, is the study of uranium transformations in subsurface environments with a view to developing technologies for immobilizing uranium contamination by chemical or biological reduction of U^{6+} to the less mobile U^{4+} species.

4. Personal contribution of the candidate and vision for the development of the subject

Dr. Boyanov has been working in the field of molecular biogeochemistry for 25 years and has gained considerable experience. Therefore, I believe that the scientific and applied scientific contributions of the presented works are mainly his merit. Considering the interdisciplinary nature of the research area, the candidate successfully cooperates with scientists from other fields.

The development of the subject is prospective in view of the expedient treatment of the waste products from human activities and preservation of the purity of the natural resources (soils, underground and surface water bodies, atmosphere).

5. Reflection of the candidate's scientific publications in the specialized literature

The number of citations of the publications presented for the competition - over 1,000, as well as the numerous invited lectures at universities abroad and at international conferences, documented in the competition materials, speak for the high scientific level of the research work of Dr. Boyanov.

6. Personal acquaintance with the candidate

I am not personally acquainted with Dr. M. Boyanov

7. Critical notes and recommendations

I have no critical notes. I would recommend Dr. Boyanov to convey his rich experience to scientists from the laboratory "Transfer Processes in Multiphase Media" at IChE-BAS and to form a prominent scientific group in the field of molecular biogeochemistry.

CONCLUSION

The research work of Dr. Boyanov is in a prospective scientific field related to disposal of wastes from human activities and environmental protection. The high quality of the presented scientific works, the active project, organizational and pedagogical activities of Dr. Boyanov vastly exceed the requirements of IChE-BAS for holding the academic position "Professor". All this gives me reason to propose Dr. Maxim Ivanov Boyanov to occupy the academic position of "Professor" in professional direction 4.2. "Chemical Sciences", specialty "Processes and Apparatus in Chemical and Biochemical Technology" at IChE-BAS, for the needs of the laboratory "Transfer Processes in Multiphase Media".

Date: November 28, 2022
Sofia

Signature:
/Prof. DSc Elisaveta Ivanova/