STATEMENT

by **Assoc. Prof. Venelin Neychev Hubenov, PhD**
Stephan Angeloff Institute of Microbiology – Bulgarian Academy of Sciences

Subject: competition for the academic position of "Associate Professor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.2. Chemical Sciences, scientific specialty "Inorganic Chemistry", for the needs of Burgas State University "Prof. Dr. Asen Zlatarov", announced in the State Gazette, issue No. 89 of 24.10.2025.

The present opinion has been prepared in accordance with Order No. RD-4/05.01.2026 of the Rector of Burgas State University "Prof. Dr. Asen Zlatarov".

Candidate(s): Chief Assistant Prof. Eng. Dencho Ivanov Mihov, PhD – the only candidate.

The submitted set of documents complies with the requirements of Chapter III, Section III of Conditions and procedures for holding the academic position of Associate Professor of the Regulations for the Conditions and Procedures for Acquiring Scientific Degrees and Holding Academic Positions at Burgas State University "Prof. Dr. Asen Zlatarov", in accordance with the Act on the Development of the Academic Staff in the Republic of Bulgaria and the internal regulations for its implementation.

I do not personally know the candidate, I have no joint publications with him, and I have no conflict of interest in accordance with the law.

The only candidate in the announced competition is Eng. Dencho Ivanov Mihov, PhD, who in the period 1982–1988 obtained higher education with the qualification Chemical Engineer, specializing in "Technical Rubber and Plastics." In 2023 he obtained the educational and scientific degree "Doctor" (PhD) after defending a PhD thesis entitled "Experimental and Theoretical Studies of Selenate Systems" in the professional field 4.2 Chemical Sciences, scientific specialty "Inorganic Chemistry."

The report on scientific production and the overall professional activity submitted by Dr. Mihov demonstrates both teaching and research experience precisely in this research area, indicating a consistent and sustained scientific interest focused on the experimental and theoretical investigation and characterization of selenium-containing compounds.

The candidate's professional experience includes active teaching activities involving seminars and laboratory classes in "Stoichiometric Calculations" and "Inorganic Chemistry" during the period 1988–1998, while successively holding the positions of Assistant, Senior Assistant, and Chief Assistant. Since 2023, he has resumed active teaching at Burgas State University "Prof. Dr. Asen Zlatarov", delivering lectures and conducting practical classes in the disciplines "Inorganic

Chemistry," "General Chemistry," and "Applied Chemistry," as well as seminar classes in "Stoichiometric Calculations" and "Inorganic Chemistry."

Dr. Mihov participates in the competition for the academic position of Associate Professor with a total of 25 scientific publications, 12 of which are published in refereed and indexed journals. Among them, one monograph is presented as a habilitation work (*Mihov, D., "Synthesis, Characteristics and Application of Double Selenates," Libra Scorp Publishing House, 2025 (200 pp.), ISBN 978-619-273-177-9.*). Under Indicator G, the candidate has included one monograph that is not submitted as a habilitation work (*Mihov, D., "Quantum-Chemical Modelling of Selenium-Containing Compounds," Libra Scorp Publishing House, 2025 (172 pp.), ISBN 978-619-273-178-6.*) as well as one published book based on the defended doctoral dissertation (*Mihov, D., "Experimental and Theoretical Studies of Selenate Systems," Libra Scorp Publishing House, 2024 (200 pp.), ISBN 978-619-273-063-5.*)

The publications listed under Indicator G7 number nine and are distributed as follows: 2 publications in Q1 journals, 5 publications in Q2 journals, 1 publication in a Q3 journal, 1 publication in a Q4 journal. Dr. Mihov's scientific works have been published in prestigious international journals, including *Journal of Chemical Thermodynamics*, *Crystal Research and Technology*, *Journal of Molecular Structure*, among others. The candidate is also the author of three university teaching manuals and co-author of one additional teaching aid. He has participated in four research projects, serving as principal investigator of one of them.

The teaching workload of Chief Assistant Prof. Dr. Eng. Dencho Ivanov Mihov in the courses Inorganic Chemistry, Chemistry, and General Chemistry, as well as in the practical classes in Stoichiometric Calculations, which are permanently included in the curricula of Burgas State University "Prof. Dr. Asen Zlatarov" and approved by the respective accreditation commissions, covers the required teaching load of 400 hours adopted by the University. It should also be noted that the candidate has supervised four successfully graduated diploma students.

The publications submitted for participation in the competition have been cited 58 times according to Scopus (excluding self-citations), which corresponds to 116 points under Indicator "D", exceeding the required minimum of 60 points set by the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and the regulations of Burgas State University. The attached report provided by Dr. Mihov confirms that he fully meets the minimum national requirements for holding the academic position of Associate Professor, fulfilling the regulatory indicators under Groups B, G, and D.

Main Research Directions and Major Contributions

Dr. Mihov's research interests are primarily focused on the experimental and theoretical investigation and characterization of selenium-containing compounds—a field of significant importance for the development of modern chemistry and its related interdisciplinary areas. The main contributions of his research can be structured into five major scientific directions:

1. As a result of experimental investigations covering the entire concentration range of the ternary aqueous salt systems $Na_2SeO_4 - CdSeO_4 - H_2O$, $Na_2SeO_4 - MnSeO_4 - H_2O$, $Na_2SeO_4 - CuSeO_4 - H_2O$, and $Na_2SeO_4 - ZnSeO_4 - H_2O$, the formation of new double salts has been demonstrated and the equilibrium crystallization fields have been determined.

2. The isopiestic method was used for the experimental determination of water activity at different component concentrations in binary aqueous salt systems of alkali and divalent selenates, and the corresponding osmotic coefficients and activity coefficients were calculated. Based on the obtained experimental data for the activity coefficients of the binary solutions, a quantitative description of the ternary systems was carried out, including both their thermodynamic parameters (osmotic coefficients, activity coefficients, water activity, chemical potential, Gibbs energy, etc.) and the theoretical calculation of solubility isotherms of ternary systems composed of the corresponding binary solutions. For the ternary systems of the simple eutonic type $Li_2SeO_4 - NiSeO_4 - H_2O$ and $Na_2SeO_4 - NiSeO_4 - H_2O$ at 25 °C, very good agreement was obtained between the experimental data and the theoretically calculated values based on modelling using the activity coefficients of the binary solutions of the initial salts.

3. By applying the Pitzer method, thermodynamic modelling of equilibrium in ternary aqueous selenate systems was performed. As a result, thermodynamic models were developed and validated for predicting solubility and solid–liquid equilibrium in systems of the type 1–2: Li_2SeO_4–H_2O, Na_2SeO_4–H_2O, $(NH_4)_2SeO_4$–H_2O, K_2SeO_4–H_2O, Rb_2SeO_4–H_2O, and Cs_2SeO_4–H_2O. Both binary and ternary aqueous selenate systems involving Li, Na, Mg, and Ni ions were modelled, and the equilibrium crystallization fields of the respective components were determined. The obtained data show very good agreement with experimental results.

4. The double selenate salts were characterized in two directions—experimentally and through quantum-chemical modelling. Data on the heat capacities of the selenates, obtained by differential scanning calorimetry (DSC), were used to calculate several thermodynamic parameters of the respective salts, and their osmotic and activity coefficients in solution were determined. Quantum-chemical modelling, performed using a modern DFT approach (Density Functional Theory), enabled the analysis of normal vibrations. By determining the characteristic absorption bands and comparing them with available literature data, the

molecular structures and geometric parameters of the synthesized compounds were established.

5. A probabilistic assessment of the potential applications of the synthesized double salts of selenic acid was carried out. Their possible use as ingredients in agricultural insecticides has been suggested. The potential application of nonlinear optical crystals in optoelectronics has also been discussed. Possible medical and pharmacotherapeutic applications, based on the inhibitory effect of selenates on tumors, have been investigated and demonstrated through studies on cell lines. It was found that the cobalt complex induces apoptosis in lymphoma cells, while cobalt and iron salts exhibit pronounced cytotoxic activity toward HepG2 cell lines, with IC_{50} values for cell viability reached at concentrations several times lower than those of the control substances.

CONCLUSION

Based on the analysis of the content and quality of the materials submitted for the competition, I consider that the candidate, Chief Assistant Prof. Dr. Dencho Mihov, meets the quantitative criteria for holding the academic position of Associate Professor, established by the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and the Regulations of Burgas State University "Prof. Dr. Asen Zlatarov." His research activity makes a significant contribution to the investigation and characterization of selenium-containing compounds. In addition, it is accompanied by active participation in teaching activities, which further demonstrates his professionalism and commitment to the advancement of science. As a member of the scientific jury for the announced competition, I give a positive evaluation and strongly recommend that the esteemed members of the jury vote in favor of electing Dr. Dencho Mihov to the academic position of Associate Professor in the professional field 4.2 Chemical Sciences, scientific specialty "Inorganic Chemistry," for the needs of Burgas State University "Prof. Dr. Asen Zlatarov."

March 10, 2026

Sofia, Bulgaria

Prepared by: ..

/Assoc. Prof. Venelin Hubenov, PhD/