

SCIENTIFIC STATEMENT

by **Assoc. Prof. Yana Koleva Koleva, PhD, Eng.**,

Member of the Scientific Jury

for a competition for the academic position of "**Associate Professor**"

in the Area of Higher Education **4. Natural Sciences**, Mathematics and Informatics,
Professional Field **4.2. Chemical Sciences**, Scientific Specialty "**Inorganic Chemistry**",
announced in the State Gazette, issue 89/24.10.2025

with candidate: **Chief Asst. Prof. Dencho Ivanov Mihov, PhD, Eng.**

1. General Characteristics of the Candidate's Research and Applied Scientific Activities

Pursuant to Order No. RD-4 of 05.01.2026 by the Rector of the Burgas State University "Prof. Dr. Assen Zlatarov", I have been appointed as a member of the Scientific Jury for a competition for the academic position of "Associate Professor" in the Professional Field 4.2. Chemical Sciences, Scientific Specialty "Inorganic Chemistry", announced for the needs of the Department of Chemistry at the Faculty of Natural Sciences of the same higher education institution.

For participation in the announced competition, the candidate Chief Asst. Prof. Dencho Ivanov Mihov, PhD, Eng., has submitted the necessary documents and scientific production, which fully comply with the eligibility requirements for candidates for the academic position of "Associate Professor", in accordance with the Regulations for Application of the Development of Academic Staff in the Republic of Bulgaria Act (RADASRBA), as well as the specific requirements of the Regulations on the Terms and Conditions for Acquisition of Scientific Degrees and Occupation of Academic Positions, and the Regulations on the Terms and Conditions for Occupation of Academic Positions at the Burgas State University "Prof. Dr. Assen Zlatarov".

Indicator Group	Indicator	Minimum for "Associate Professor"	Candidate
Group A	Indicator 1 Dissertation for the award of the educational and scientific degree "Doctor" (PhD)	50	50
Group C	Indicator 3 Habilitation thesis – monograph	100	100
Group D	Сума от показателите от 5 до 10	200	227
	Indicator 5 Published monograph, distinct from the main habilitation work.	30	30
	Indicator 6 Published monograph based on a doctoral thesis for the award of a PhD degree or a Doctor of Science (DSc) degree.	20	20
	Indicator 7 Scientific publication in editions that are peer-reviewed and indexed in world-renowned databases of scientific information (Web of Science and Scopus), separate from the habilitation work.		177
Group E	Sum of points for Indicator 11	100	106
	Indicator 11 Citations in scientific publications, monographs, collective volumes, and patents, peer-reviewed and		106

	indexed in world-renowned databases of scientific information (Web of Science and Scopus).		
Group F	Sum of indicators from 12 to the end	100	116
	Indicator 14 Participation in a national scientific or educational project		30
	Indicator 16 Leadership of a national scientific or educational project		20
	Indicator 20 Published university teaching aid or a teaching aid used in the school system		66
	Total:	Minimum 550	559

Group A and C: The candidate holds the educational and scientific degree of “Doctor” (PhD) and presents an original habilitation work in the form of a monograph (100 pts), which is a mandatory requirement for holding the position of „Associate Professor“.

Group D: The candidate exceeds the minimum requirements (227 points, with a threshold of 200 points). Scientific output beyond the habilitation work includes an additional monograph, a book based on the doctoral thesis, and nine scientific publications (177 pts) in prestigious journals (*Journal of Molecular Structure, Monatshefte für Chemie, Zeitschrift für Physikalische Chemie, Journal of Chemical Thermodynamics, Crystal Research and Technology, and Bulgarian Chemical Communications*), indexed in the global databases (Web of Science and Scopus). This demonstrates the international scientific community's recognition of the candidate's research.

Group E (Citations): The candidate's research activity is confirmed by 106 points from 53 citations in international databases, demonstrating that his/her works attract significant interest and serve as a foundation for further scientific developments by peers in the field.

Group F (Scientific and Applied Activities): The candidate demonstrates strong activity in project funding—both as a participant (three projects) and as a principal investigator of a national scientific project. Particularly valuable is his/her contribution to the educational process through the publication of four university teaching aids (66 pts), which serves as direct evidence of his/her high level of scientific and pedagogical expertise.

The scientific output submitted for the competition by Chief Assistant Professor Dencho Ivanov Mihov, PhD, Eng., is in full compliance with the scientific specialty of “Inorganic Chemistry”. The candidate enters the procedure with a compelling set of materials that meet and exceed the minimum national requirements, as well as the specific requirements of “Prof. Dr. Assen Zlatarov” Burgas State University. All procedural rules for the announcement and participation in the competition have been observed.

2. Evaluation of the candidate's pedagogical training and teaching activities

Chief Assistant Professor Dencho Ivanov Mihov, PhD, Eng., defended his doctoral dissertation for the award of the educational and scientific degree of “Doctor” (PhD) in 2023. The degree was awarded in Professional Field 4.2. Chemical Sciences, scientific specialty “Inorganic Chemistry”, on the topic: “Experimental and Theoretical Studies of Selenate Systems”. His academic career began in 1988 at the Higher Institute of Chemical Technology in Burgas (now Burgas State University “Prof. Dr. Assen Zlatarov”), where until 1998 he progressively held the positions of Assistant Professor, Senior Assistant Professor, and Chief Assistant Professor. Since 2023, he has once again held the academic position of “Chief Assistant Professor” at the same university. The candidate completed his

higher education in 1988 at the Higher Institute of Chemical Technology – Burgas, qualifying as a Chemical Engineer.

The pedagogical activity of Chief Assistant Professor Dencho Ivanov Mihov, PhD, Eng., is characterized by long-standing experience, continuity, and a high level of professional responsibility. An analysis of the submitted reports provides grounds for the following findings:

Teaching experience and academic career progression: The candidate's academic career began in 1988 at "Prof. Dr. Assen Zlatarov" University, where he progressed through all stages of career development—from Assistant Professor to Chief Assistant Professor. This serves as evidence of significant methodological experience gained and an excellent command of the university's academic standards.

Teaching load and academic courses: From the materials submitted for the competition, it is evident that Dr. Eng. Mihov meets the University's established annual teaching load of 400 hours. Although the documentation does not include an explicit official certificate regarding the workload for the 2023–2026 period, the list of courses taught confirms his active teaching engagement.

He conducts lecture courses and practical exercises in key fundamental disciplines such as:

- Inorganic Chemistry (Part I and II);
- Stoichiometric Calculations;
- General Chemistry;
- Specialized courses for medical students and postgraduates.

Methodological support for the educational process: A positive highlight is the authorship of three new textbooks published in 2025, specifically designed to meet the practical needs of students. These manuals (in Inorganic Chemistry, Stoichiometry, and Chemistry for Medical Students) demonstrate the candidate's ability to systematize complex scientific matter and present it in an accessible manner.

Supervision of Graduate Students: He has successfully supervised 4 graduate students, which serves as a testament to his mentoring skills and his ability to prepare young professionals for the demands of both science and industry.

Development of educational programs: He has taken an active part in updating curricula, specifically „Stoichiometric Calculations“ for Bachelor students, showcasing his modern perspective on education.

3. Key scientific and practical contributions

The candidate's research activities are focused on the multidisciplinary study of selenate systems—ranging from fundamental thermodynamics to innovative biomedical applications. The contributions can be summarized in three key areas:

1. Fundamental physicochemical studies and modeling

Phase Equilibria: A systematic experimental characterization of dozens of multicomponent aqueous-salt systems at 25°C has been conducted. New solubility isotherms and equilibrium crystallization fields have been determined.

Thermodynamic Analysis: By applying the Pitzer approach, precise mathematical models have been developed to describe non-ideality in electrolyte solutions. Key parameters, such as osmotic coefficients and Gibbs free energy, were calculated, showing excellent agreement between theory and experiment.

2. Synthesis and Structural Characterization of New Materials

Pioneering Synthesis: Specific groups of double selenate salts based on alkali and transition metals have been synthesized for the first time, representing a significant contribution to synthetic inorganic chemistry.

Spectral and Quantum Chemical Analysis: Modern methods, such as Density Functional Theory (DFT) and Infrared (IR) spectroscopy, have been applied to define the molecular architecture and vibrational characteristics of the new compounds.

3. Applied Scientific Perspectives and Biological Activity

Oncology and Medicine: A pronounced cytotoxicity of the newly synthesized selenates (cobalt-iron-selenium) against the HepG2 liver cancer cell line has been established. A synergistic effect has been demonstrated, which exceeds the efficacy of salts containing individual elements.

High-Tech Applications: The potential of the synthesized crystals as materials with non-linear optical (NLO) properties for laser technology and optoelectronics has been identified, alongside their applications in modern agriculture (as insecticides).

The presented works demonstrate a complete cycle of interdisciplinary research—ranging from theoretical prediction and laboratory synthesis to the verification of biological activity and practical significance.

4. Scientific and practical significance of the contributions

The presented works demonstrate a complete cycle of scientific research—ranging from theoretical prediction and laboratory synthesis to the verification of biological activity and practical significance.

1. Scientific and Theoretical Significance

Fundamental Contribution to Inorganic Chemistry: Enriching global databases with new data on phase equilibria and crystallization conditions for a broad group of selenate systems.

Methodological Development: The successful adaptation and application of the Pitzer approach for describing non-ideal electrolyte systems establishes modern physicochemical models as a reliable tool for predicting phase behavior.

Structural Diagnostics: The combination of experimental methods (IR spectroscopy, DSC) with quantum chemical calculations (DFT) brings the research to the level of leading global standards in molecular modeling.

2. Applied Scientific and Technological Significance

Optimization of Chemical Processes: The developed thermodynamic models allow for the precise design of synthesis processes for pure substances and new materials, saving time and resources on costly laboratory testing.

Innovations in Materials Science: The identification of non-linear optical (NLO) properties in the synthesized crystals opens doors for their application in laser technology, optoelectronics, and communication technologies.

Environmental and Geochemical Aspects: The results are applicable to the modeling of chemical element migration in natural waters and soils, which is of fundamental importance for environmental protection.

3. Social and Biomedical Significance

Contribution to Oncology: The proven high cytotoxicity of the new selenate complexes against liver cancer cells (HepG2) represents a significant step toward developing a new generation of antitumor drugs with fewer side effects.

Agrochemical Significance: The potential use of these compounds in insecticides and bioactive additives offers sustainable solutions for enhancing efficiency in agriculture.

The candidate's scientific work not only expands the boundaries of theoretical knowledge but also offers concrete, applicable solutions to contemporary challenges in medicine, technology, and ecology. The high quality of the publications (predominantly in Q1 and Q2 journals) is indisputable evidence of the international recognition and significance of these contributions.

5. Critical Remarks

I recommend that the candidate, in their future activities, should:

1. Expand the panel of investigated cancer cell lines.
2. Deepen the research into the molecular pathways of apoptosis induction.
3. Direct his efforts toward protecting intellectual property through patent applications.
4. Strengthen his participation in international scientific consortia.

6. Conclusion

Based on my review of the submitted scientific works, their significance, the scientific-applied and practical contributions contained therein, and the fact that the candidate exceeds the minimum requirements for some indicators—in accordance with the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and the Internal Regulations of Burgas State University „Prof. Dr. Assen Zlatarov“ —I find it justified to propose that Chief Assistant Professor Dencho Ivanov Mihov, PhD, Eng. be appointed to the academic position of „Associate Professor“ in Professional Field 4.2. Chemical Sciences, specializing in „Inorganic Chemistry“.

Date: 25 February 2026
City of Burgas

SCIENTIFIC JURY MEMBER:
/Assoc. Prof. Yana Koleva, PhD, Eng./