

OPINION

By Assoc. Prof. Dr. Svetlana Dimitrova Zheleva, PhD, Prof. Dr. Asen Zlatarov University of Burgas, Member of the Scientific Jury, according to the order No. RD-235/15.07.2024 of the Rector of "Prof. Dr. Asen Zlatarov University" of Burgas

Regarding the application for the academic position of Professor, announced in the State Gazette, issue 43/17.05.2024, Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, **Professional Field 4.2 Chemical Sciences**, Scientific specialty "**Chemistry**" at the "Prof. Dr. Asen Zlatarov" University of Burgas

1. Brief Biographical Data

Assoc. Prof. Romyana Zlatinova Yankova-Avramova is the only applicant for the current competition. She graduated in 1990 as a Chemical Engineer in Inorganic and Electrochemical Production, with a second specialty in Pedagogy, and in the same year she won a competition for Assistant Professor in the Department of Inorganic Chemistry of "Prof. Dr. Asen Zlatarov" University of Burgas. After that, she acquired a foreign language specialization in English and successfully completed the course "Creative Thinking, Creative-Innovation Techniques" in 2010 and 2015, respectively.

In 2015 the candidate defended her thesis at "Angel Kanchev" University of Rousse in the PhD program "Methodology of Physics Education (Natural Sciences)" on the topic "Methodological system for the application of the physicochemical experiment in the preparation of students for the formation of natural science literacy of students", after that in 2016 she was awarded the academic position "Associate Professor" in the professional field 4.2 Chemical Sciences, scientific specialty "Inorganic Chemistry".

Currently, Assoc. Prof. Romyana Yankova is a lecturer in chemical disciplines, including inorganic chemistry, organic chemistry and physical chemistry. She is an expert in quantum chemical calculations and structural inorganic chemistry.

The administrative commitments of Assoc. Prof. Romyana Yankova start in 2019 with her election as Head of the Department of Physiology, Pathophysiology, Chemistry and Biochemistry and Deputy Dean of the Faculty of Medicine. At the end of 2023 she was elected Dean of the Faculty of Medicine at "Prof. Dr. Asen Zlatarov" University of Burgas.

2. General Description of the Submitted Materials

The documentation of the competition meets the requirements of Article 73 paragraph 2 of the Regulation on the Condition and Procedure for Acquisition of Academic Degrees and the Habilitation Procedure at University "Prof. D-r. Asen Zlatarov" of Burgas.

A report on 25 new and updated curricula developed for students in Bachelor's, Master's and Doctor's degree programmes in professional fields 7.1 Medicine, 5.13 General Engineering, 5.10 Chemical Technologies, 5.6 Materials and Materials Science and 4.2 Chemical Sciences is presented, as well as a report on 8 published educational manuals on taught disciplines.

Under the successful scientific guidance of Assoc. Prof. Romyana Yankova, two PhD students have acquired their PhD degrees – Eng. Dencho Mihov from "Prof. Dr. Asen Zlatarov" University of Burgas in 2022 and Tsvetan Tsenov from "Episkop Konstantin Preslavsky" University of Shumen in 2024. A list of 20 students prepared on various topics for participation in scientific forums and 8 graduates who successfully defended their theses under the supervision of the candidate is provided.

Since the beginning of her scientific career, Assoc. Prof. Romyana Yankova presents a list of 119 scientific units, including 52 publications and one monograph "Complexochemical equilibria and electronic characteristics of some coordination compounds", declared in previous

competitions for obtaining the PhD degree and holding the academic position of Associate Professor and 35 publications, beyond the evaluation of those declared in the current competition. In the proceedings of scientific conferences with abstracts 27 scientific communications were reported.

In the competition for the academic position "Professor" the candidate presents 30 scientific publications in the following journals:

Journal of Molecular Liquids (Q1; IF: 4.561-6.633; SJR: 0.862-0.929) [1, 6-10]

Journal of Molecular Structure (Q2; IF: 2.463-3,841; SJR: 0.450-0.570) [2, 4, 5, 15, 16]

Fuel (Q1; IF: 8.035; SJR: 1.514) [11]

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy (Q2; IF: 3,232-4.40; SJR: 0.550-0.635) [3, 13, 14]

Thermochimica Acta (Q2; IF: 2.251; SJR: 0.722) [12]

Journal of Chemical Research (Q3; IF: 0.593; SJR: 0.193) [17]

Oxidation Communication (Q3 IF: 0.420-0.690; SJR: 0.216-0.224) [18-21, 23-25, 27]

Journal of Chemical Technology and Metallurgy (Q3 IF: 0.780, 0.810; SJR: 0.220, 0.253) [22, 26, 28]

Reaction Kinetics Mechanisms and Catalysis (Q3 IF: 1.920; SJR: 0.329) [29, 30]

Citation record of 18 scientific publications is 150. A reference to Scopus to date shows 277 citations (excluding author citations), with the productivity and significance of the candidate's publications assessed with an h-index of 13.

Certificates of participation in two national and one international project have been provided.

3. Teaching Activities

Assoc. Prof. Dr. Romyana Yankova carries out teaching and learning activities in the form of lectures, seminars and laboratory exercises in various chemical disciplines for students in the Bachelor's and Master's degree programmes in Professional Fields 7.1 Medicine, 5.13 General Engineering, 5.10 Chemical Technologies, 5.6 Materials and Materials Science and 4.2 Chemical Sciences. The detailed reference provided also shows lecturing and conducting laboratory exercises for the English-speaking medical students, as well as teaching courses for educational preparation in various PhD programmes. As a supervisor she participated in the preparation of eight graduates, six of them in the specialty "Informatics and Information Technologies in Chemistry and Chemical Education", one from the specialty "Computer Systems and Technologies" and one from the specialty "Medicinal Chemistry".

Participated in the establishment of a teaching laboratory on "Methodology and technique of chemical demonstrations in inorganic chemistry" for students of Chemistry and Informatics and information technologies in chemistry and chemical education and a teaching laboratory on "Chemistry" for medical students.

4. Research and scientific contributions

The research activity of Assoc. Prof. Romyana Yankova covers a 33-year period of academic development. Under her guidance 8 students have successfully graduated in the Master's degree programme and two PhD students have obtained their PhD degrees. With her expertise, she has been involved in one international, two national and 13 internal university projects, three of which she has been the leader. He has presented 36 national and international scientific conferences and 119 scientific publications.

The scientific and scientific-applied contributions are presented in six thematic areas.

I. Preparation and characterization of new ionic liquids

In order to obtain and characterize new active and stable homogeneous and heterogeneous catalysts for esterification, new ionic liquids were synthesized: pyridine dihydrogen phosphate,

imidazolium hydrogensulfate, imidazolium hydrogenselenate. The same are a combination of organic cation and inorganic anion and are characterized by up to 100°C melting point, zero saturation vapor pressure and high thermal stability.

The properties and reactivity of the obtained new ionic liquids and pyridine hydrogensulfate, pyridine nitrate, 4-amino-1H-1,2,4-triazole nitrate, 2-amino-1,3-thiazole hydrogensulfate sulfate monohydrate were investigated. The aromaticity of inorganic anion in the structure of ionic liquids has been documented. Pyridine hydrogensulfate, pyridine dihydrogen phosphate and imidazole hydrogensulfate were found to possess nonlinear optical properties.

II. Analysis of surface phenomena occurring in heterogeneous ionic liquids

The contributions to the scientific direction are related to the investigation of the phenomena of the ionic flow-carrier boundary surface at heterogeneous systems: pyridine hydrogen sulfate/ α -Al₂O₃ [publ. 9 and 14], pyridine hydrogensulfate pyridines/ rice husk ash [publ. 9], 2-amino-1,3-thiazoles hydrogensulfate sulphate monohydrate/ α -Al₂O₃ [publ.1], imidazoles hydrogen sulfate/ κ -Al₂O₃ and 2-amino-1,3-thiazoles hydrogensulfate sulfate monohydrate/ κ -Al₂O₃ [publ. 30]. Vibrational couplings in ionic liquids are investigated for the first time and the nature of surface interactions in these heterogeneous systems is elucidated as a function of the nature of the carrier.

The spatial arrangement of the immobilized active phase on the carrier surface in heterogeneous pyridine hydrogensulfate/ α -Al₂O₃, pyridine hydrogensulfate/rice husk ash systems was determined.

III. Study of thermal decomposition kinetics of ionic liquids

Using a combined approach of experimental (TGA, DSC) and quantum chemical (Hirschfeld surface, non-covalent interaction method) methods of analysis, the thermal behavior of ionic liquids pyridine hydrogen sulfate was investigated for the first time, pyridine dihydrogen phosphate, pyridine nitrate and the heterogeneous systems (pyridine hydrogen sulfate/ α -Al₂O₃ and pyridine hydrogen sulfate/rice husk ash) obtained on their basis. The melting and decomposition mechanisms of the samples were determined as a function of the degree of intramolecular hydrogen bonding and the nature of the carrier.

The kinetics of thermal decomposition of pyridine nitrate was investigated for the first time.

IV. Application of ionic liquids as effective catalysts for esterification

The synthesized ionic liquids: pyridine hydrogensulfate, 4-amino-1H-1,2,4-triazole nitrate, 2-amino-1,3-thiazole hydrogensulfate sulfate monohydrate, pyridine nitrate, pyridine dihydrogen phosphate, pyridine hydrogensulfate/ α -Al₂O₃ and pyridine hydrogensulfate/rice husk ash heterogeneous systems were investigated for catalytic activity in butyl acetate and methyl oleate (biodiesel) production processes. A mechanism of butylacetate preparation by formation of an active complex involving ionic liquid pyridine hydrogensulfate as a catalyst is described.

Based on detailed kinetic and thermodynamic analysis, the optimum conditions for the preparation of butyl acetate and methyl oleate in the presence of pyridine hydrogensulfate, 4-amino-1H-1,2,4-triazole nitrate and pyridine nitrate were established.

V. Characterization of compounds with a purpose of their application

In the field of medicine, quinoxalines, in particular quinoxalindiones, are a class of compounds that find application in the treatment of epilepsy and other neurodegenerative disorders. A new compound derived from quinoxaline-2,3-dione, 1,4-dialyl-6-chloroquinoxaline-2,3-(1H,4H)-dione, has been synthesized and its reactivity has been studied.

By theoretical approaches and calculations, the compounds carvone and linalool have been studied. The results obtained were used to interpret the difference in antimicrobial and antioxidant activity of the compounds.

A novel synthetic block-co-polymer, homogeneous PDMS-b-PAA (polydimethylsiloxane-block-polyacrylic acid) with different chain lengths of PAA was designed. The resulting surfaces show improved characteristics, favor epithelial cell attachment and proliferation.

Results were obtained demonstrating that chitosan nanoparticles affect the ordering and organization of lipids in biomimetic membranes, increasing the degree of lipid ordering in a concentration-dependent manner. The results increase knowledge related to drug application, cytotoxicology and cancer treatment.

VI. Preparation, characterization and reactivity studies of coordination compounds

The coordination compounds have been theoretically and experimentally characterized: dioxomolybdenum(VI) complex with glycylglycine; bis(2-aminothiazole)dibromozinc(II); bis(2-aminobenzothiazole-N)dichlorocobalt(II); [Pt(3-amino-1,2,4-triazole)₂Cl₂] and bis(benzimidazole)silver(I) nitrate.

The cytotoxicity of platinum(II) complex with 3-amino-1,2,4-triazole was evaluated and found to be a suitable nanomaterial for various biomedical applications including anticancer therapy.

The antibacterial effect of silver(I) complex with benzimidazole was evaluated against Gram-negative *E. coli* ATCC25922 and Gram-positive *Staphylococcus aureus* ATCC 25923.

5. Compliance in requirements for the academic position “Professor”

The documentation presented by Assoc. Prof. Romyana Yankova for the competition for the academic position “Professor” is complete and meets the regulatory requirements and criteria of the of the Regulation on the Terms and Procedure for Acquisition of Academic Degrees and the Habilitation Procedure at University “Prof. D-r. Asen Zlatarov” of Burgas.

Groupe A of indicators – A1 PhD thesis

– PhD thesis on “Methodological System for the Application of the Physicochemical Experiment in the Preparation of Students for the Formation of Natural Science Literacy of Students”, Diploma №RU-NS-2015-47, issued on 13.11.2015, Professional field 1.3 Pedagogy of Education in. **(50 points)**

Groupe B of indicators – B4 Habilitation thesis – scientific publications, referenced and indexed in databases Web of Science and Scopus

– 9 publications are presented [1-9], five in Q1 and four in Q2. **(205 points)**

Groupe Γ of indicators – Γ7 Scientific publications, referenced and indexed in databases Web of Science and Scopus

– 21 publications are presented, respectively in quartiles: Q1 – [10-12]; Q2 – [13-16]; Q3 – [17-30]. **(365 points)**

Groupe Δ of indicators – Δ11 Citations in scientific journals, monographs, collective volumes and patents, referenced and indexed in databases Web of Science and Scopus

– a reference with 150 citations of publications is presented. **(300 points)**

Groupe E of indicators – E13 Supervision of a successfully defended PhD student

– one supervisor of a PhD student and one co-supervisor of a PhD student **(75 points)**.

E14 and E15 Participation in a national/international scientific or educational project

– participation in 2 national projects **(20 points)** and one international research project **(20 points)** has been declared.

E20 Published students’ book that is used in the school network

– 8 teaching materials are presented as author and co-author. **(111.8 points)**

The total number of points from the groups of indicators that Assoc. Prof. Romyana Yankova collected is 1146.8 points, while the required for the academic position “Professor” is 600 points according to the minimum national requirements and 1000 points according to the minimum requirements of the Regulation on the Condition and Procedure for Acquisition of Academic Degrees and the Habilitation Procedure at University “Prof. D-r. Asen Zlatarov” of Burgas. The number of points for each group of indicators significantly exceeds the minimum required under both Regulations.

6. Conclusion

I know Assoc. Prof. Romyana Yankova as a colleague, lecturer and researcher, with accumulated serious knowledge and expertise in the scientific field in which she works. She is a recognized scientist in the field of quantum chemical calculations, synthesis and characterization of ionic liquids, study of the structure and properties of coordination compounds, and characterization of compounds through theoretical and experimental approaches in view to find optimal applications.

On the basis of the documents submitted for the competition, as well as on my personal impressions of the candidate, I confidently express my positive assessment of the professional path and scientific development of Assoc. Prof. Romyana Yankova.

I propose to the honorable members of the Scientific Jury to recommend to the Faculty Council of the Faculty of Natural Sciences of the "Prof. Dr. Asen Zlatarov" University of Burgas *to elect Assoc. Prof. Romyana Zlatinova Yankova-Avramova to the academic position "Professor"* in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field **4.2 Chemical Sciences**, scientific specialty "**Chemistry**".

30.07.2024 г.

Member of the Scientific Jury

Assoc. Prof. Svetlana Zhéleva