

OPINION

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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-11/14.01.2022 of the Rector of "Prof. Dr. Asen Zlatarov University" of Burgas

Regarding the application for the academic position of Associate Professor, announced in the State Gazette, issue 95/16.11.2021, Area of Higher Education 4. Natural Sciences, Mathematics and Informatics, **Professional Field 4.2 Chemical Sciences**, Scientific specialty "Chemical kinetics and catalysis", for the needs of the Department of Chemical Technology, "Prof. Dr. Asen Zlatarov" University of Burgas

1. Brief Biographical Data

Chief assistant professor Ivailo Georgiev Tankov, PhD is the sole applicant for the academic position of Associate Professor in the current competition. In 2007 he graduated from University Prof. Dr. Asen Zlatarov of Burgas with a Master's degree with a professional qualification "Chemical Engineer" and competence in the field of organic synthesis, polymer processing, oil and gas technology and fuel lubricants. For three years he developed his thesis at the Institute of Catalysis-BAS on "Preparation and characterization of catalysts for methane reforming", which he successfully defended in 2013. During his PhD studies, the candidate acquired knowledge in reaction kinetics and catalysis and mastered specific techniques for the production of hydrogen from renewable energy sources and the synthesis and physicochemical characterization of catalysts. At the beginning of 2014 Ivailo Tankov was appointed to the academic position of "assistant professor" at University "Prof. Dr. Asen Zlatarov University" of Burgas. In 2015 he held the position of "Chief assistant professor".

2. General Description of the Submitted Materials

The documentation of the competition meets the requirements of Article 67 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 the candidate's participation in the development and updating of 13 curricula for students in the Bachelor's degree in the specialties of the professional fields 4.2 Chemical Sciences and 5.10 Chemical Technologies is provided.

The scientific production presented by Chief assistant professor Ivailo Georgiev Tankov, PhD consists of 33 articles, 31 of which have been published in journals with impact factor (Web of Science) and impact rank (Scopus), and 2 in proceedings presented in Conference Proceedings in Thomson Reuters and/or Scopus. 5 scientific communications have been presented at national and international scientific forums.

Under the competition, the candidate presents 15 scientific publications in the following journals:

- Catalysis Letters* (Q2; IF: 2.911; SJR:0.754) [1]
- Journal of Molecular Liquids* (Q1; IF: 4.513-6.165; SJR: 0.849-0.929) [2-7, 15]
- Journal of Molecular Structure* (Q2; IF: 2.011-3,196; SJR: 0.412-0.470) [8, 9, 11]
- Fuel* (Q1; IF: 6.606; SJR: 1.560) [10]
- Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* (Q2; IF: 2.931, 3.232; SJR: 0.574, 0.550) [12, 13]
- Thermochimica Acta* (Q2; IF: 2.236; SJR: 0.683) [14]*

Utility Model Certificate No. 4077U1/26.05.2021 is shown.

The observed citations of the scientific publications at the time of submission of the documents is 72. A reference made in Scopus to current date shows 149 citations, and the productivity and relevance of the candidate's publications was assessed with *h*-index 7.

3. Teaching Activities

From the moment of appointment to the academic position "assistant professor" at the University "Prof. Dr. Asen Zlatarov" of Burgas (2014) Ivaylo Tankov carries out teaching and learning activities, consisting in giving lectures, seminars and laboratory exercises to students in the Bachelor's and Master's degree programs in the professional fields 4.2 Chemical Sciences, 5.10 Chemical Technologies, 5.13 General Engineering. He is co-author of a student's book "Quantitative study of chemical reactions in petrochemical synthesis", published by University "Prof. Dr. Asen Zlatarov University" of Burgas in 2018.

4. Research and scientific contributions

The candidate presents certificates for participation in a national scientific program, one national educational project, one scientific project, as well as a certificate for participation in one international project under the Bulgaria-Turkey Cross-Border Cooperation Program 2014-2020. The scientific and scientific-applied contributions are presented in three thematic areas.

I. Preparation of new ionic liquids and investigation of their composition and structure

Five types of specimens classified as "ionic liquids" were synthesized and their composition and structure were investigated by a combination of instrumental and quantum chemical analysis. Based on the results obtained and analyzed, heterogeneous systems were synthesized by a process of impregnation of the corresponding carrier with an aqueous solution of an ionic liquid - PHS/ α -Al₂O₃, PHS/RHA и xPHS/AC. Two approaches were used to investigate their textural characteristics: (i) analyzing the phase composition, specific surface area and pore size distribution of pure and modified carriers and (ii) calculating the size of ionic liquid particles present on the carrier surface. The main scientific contributions of this thematic area relate to: the ionic liquid P2HP with established molecular geometry was synthesized for the first time; aromaticity of an inorganic anion in the structure of ionic liquids was documented; new heterogeneous systems PHS/ α -Al₂O₃, PHS/RHA and PHS/AS with investigated textural characteristics were described

II. Analysis of surface phenomena occurring in heterogeneous ionic liquids

The contributions of the research direction concern the study of ionic liquid-carrier interface phenomena in heterogeneous PHS/ α -Al₂O₃, PHS/RHA, TAHSSM/ α -Al₂O₃ and xRHS/AC systems by means of a set of infrared and X-ray photoelectron spectroscopy. Vibrational characteristics in the ionic liquids PHS and TAHSSM and the resulting heterogeneous systems were investigated for the first time. The nature of the surface interactions in PHS/ α -Al₂O₃, PHS/RHA, TAHSSM/ α -Al₂O₃ and xRHS/AS as a function of the nature of the carrier has been elucidated. The spatial location of the immobilized active phase on the carrier surface was determined for three of the heterogeneous systems.

III. Study of thermal decomposition kinetics of ionic liquids

A combined approach of experimental (TGA, DSC) and quantum chemical (Hirschfeld surface, non-covalent interaction method) methods of analysis has been used to characterize the thermal stability in inert media of some ionic liquids: PHS, ATN, P2HP, PN, PHS/ α -Al₂O₃ and

PHS/RHA, showing that the nature and degree of intramolecular interactions have a significant influence on the thermal behavior. The melting and decomposition mechanisms of the samples as a function of the degree of intramolecular hydrogen bonding and the nature of the carrier are defined. The thermal decomposition kinetics of pyridine nitrate has been investigated for the first time.

IV. Study of new ionic liquids as efficient catalysts for esterification

The scientific-applied contributions of this scientific field concern the elucidation of the catalytic behavior of pure ionic liquids and heterogeneous systems in the processes of butyl acetate and methyl oleate preparation. For the first time, P2HP, ATN, TAHSSM, PN, PHS/ α -Al₂O₃, PHS/AS and PHS/RHA have been investigated as catalytic systems and a mechanism of butylacetate production by formation of an active complex involving an ionic liquid (PHS) as a catalyst has been shown. On the basis of detailed kinetic and thermodynamic analysis, the optimum conditions for the preparation of butyl acetate and methyl oleate in the presence of PHS, ATN and PN were established.

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

The presented documentation from the candidate chief assistant prof. Ivailo Tankov, PhD for participation in a competition for the academic position of “Associate Professor” is complete and meets the regulatory requirements and criteria 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 "Preparation and characterization of catalysts for methane reforming with carbon dioxide", № 000388, 26.02.2014. **(50 points)**

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

– 5 publications are presented [1-5], four in Q1 and one in Q2. **(120 points)**

Groupe Г of indicators – Г7 scientific publications, referenced and indexed in databases Web of Science and Scopus

– 10 publications are presented, respectively in quartiles: Q1 – [6, 7, 10, 15]; Q2 – [8, 9, 11–14]. **(220 points)**

Г9 an invention, patent or utility model for which a duly protected document has been issued

– certificate of co-authorship in developed Utility Model No. 4077 / 26.05.2021 is presented **(25 point)**

Groupe Д of indicators – Д11 Citations in scientific journals, monographs, collective volumes and patents, referenced and indexed in databases Web of Science and Scopus

– a reference with 72 citations of publications is presented. **(144 points)**

Groupe E of indicators– E14 и E15 Participation in a national/international scientific or educational project

– participation in 3 national research projects **(30 points)** and one international research project **(20 points)** has been declared.

E19 Published students’ book that is used in the school network – students’ book “Quantitative Study of Chemical Reactions in Petrochemical Synthesis” published by University “Prof. Dr. Asen Zlatarov University” in 2018. **(20 points)**

The total number of points from the groups of indicators, which chief assistant professor Ivailo Tankov, PhD collected is 629, with the required for the academic position of "Associate Professor" 400 points according to the minimum national requirements and 550 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 the individual groups of indicators significantly exceeds the minimum required by both regulations, with the exception of the group of indicators "E". My personal opinion is that the group of indicators "E" for the academic position "Associate Professor" in these regulations is disproportionately high. Moreover, according to the national minimum requirements, no points are counted for this group of indicators.

6. Conclusion

I know Chief assistant prof. Ivailo Tankov, PhD as a colleague, lecturer and researcher, with accumulated serious knowledge and experience in the professional field and scientific area in which he works. I have had the privilege of working with him for the last year on an international research project and I would like to say that the team relies on and trusts his scientific evaluation. On the basis of the submitted competition documents and my personal impressions of the candidate, I would like to express my support for the candidature of chief assistant prof. Ivailo Tankov, PhD and to give my positive assessment. I propose to the Scientific Jury to recommend to the Faculty Council of the Faculty of Technical Sciences at the University "Prof. D-r. Asen Zlatarov" to approve Chief assistant prof. Ivailo Georgiev Tankov, PhD for the academic position of "Associate Professor" in the scientific area 4. Natural Sciences, Mathematics and Informatics, professional field 4.2 Chemical Sciences, scientific specialty "Chemical kinetics and catalysis".

21.03.2021 г.

Member of the Scientific Jury:

(Assoc. Prof. Svetlana Zheleva, PhD)