



*To the Chairman of the Scientific Jury  
at the Faculty of Technical Sciences  
University "Prof. d-r Asen Zlatarov" - Burgas*

## **REVIEW**

on a 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 "Chemical kinetics and catalysis", code 01.05.16

with sole candidate Ch. Assistant Professor Dr. Ivaylo Georgiev Tankov  
Reviewer Dragomir Simeonov Yankov, PhD, Professor at IIH-BAS

### **1. Brief biographical data and characteristics of the applicant's scientific interests.**

Assistant professor Ivaylo Georgiev Tankov obtained a higher education with a master's degree in 2007 at the University "Prof. Dr. Asen Zlatarov" - Burgas with a degree in "Chemical Engineering". Consecutively he works as a chemist in the company "Solimex" - Burgas, Water Park "Sunny Beach" - Burgas and "Spa Design Bulgaria" Ltd., Burgas. During the period 2009 - 2012, he was a PhD student at the Institute of Catalysis - BAS and obtained his PhD degree in 2014. The topic of the dissertation is "Preparation and characterization of catalysts for methane reforming with carbon dioxide". Since 2014 he has been appointed as an assistant, and since 2015 as an assistant professor in the Department of Chemical Technology at the University "Prof. Dr. Asen Zlatarov" - Burgas.

The scientific interests of assistant professor I. Tankov are in the field of reaction kinetics and catalysis, as well as the technology of basic organic synthesis.

### **2. General characteristics of the candidate's research, applied research, and teaching activities**

The research activity of Ch. Assistant Tankov is focused on the synthesis and characterization of new active and stable homogeneous and heterogeneous catalysts for esterification. Several topics are clearly outlined - 1) Synthesis of new ionic liquids and studying their composition and structure; 2) Study of the kinetics of thermal decomposition of ionic liquids; 3) Analysis of surface phenomena occurring in heterogeneous ionic liquids and 4) Investigation of ionic liquids as catalysts for esterification. Most of the 15 publications with which assistant professor Tankov participated in the competition are with two authors and one each with three, four, five, and six authors. In almost all publications (except two) assistant professor is the first author. The total number of publications is 33 - three included in the dissertation and 15 others. 72 citations were noticed on the publications for the competition. Assistant Professor Tankov presented also 5 (out of 14) participations in scientific forums.

Assistant Professor Tankov has participated in 4 research projects:

- National Research Program "Information and Communication Technologies for a Digital Single Market in Science, Education, and Security (ICTES)" at the Ministry of Education and Science (2018 - 2020);

- Research Agreement № CBOOS.3.12.001 "Cross-border regions cooperation for BLUE GROWTH COLLABs", funded by the Interreg IPA Cross-border Cooperation Bulgaria - Turkey 2014-2020 (Interreg IPA Cross border Cooperation Bulgaria - Turkey Program), 2020-2022;

- Project BG05M20P001-2.016-0013, "Modernization, digitalization, and internationalization of education at the University of Chemical Technology and Metallurgy" for the period: from 01.12.2021 to 30.04.2022;

- Contract DTC 02/36 "Obtaining Alternative Fuels from Renewable Carbon-Containing Raw Materials: Reforming Biogas to Hydrogen" headed by Prof. Sonya Damyanova, funded by the Research Fund in the period December 2009 - September 2012.

In the period 2014 - 2021, Assistant Professor I. Tankov has lectured and led laboratory practices in various disciplines - Reaction Kinetics and Catalysis, Technology of Organic Synthesis, Organic Chemical Technologies, etc. of students majoring in Organic Chemical Technology, Oil and Gas Technology, Chemical Technology, etc. He was the supervisor of the diploma theses of 4 graduate students. Assistant Professor Tankov has participated in the development and updating of 13 curricula for various courses.

### 3. Evaluation of the submitted materials

The applicant has submitted all necessary documents following the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria and the regulations for its implementation.

Assistant Professor I. Tankov participates in the competition with 15 publications as follows: *Journal of Molecular Liquids* - 7; *Journal of Molecular Structure* - 3; *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* - 2; *Catalysis Letters* - 1; *Fuel* - 1; *Thermochimica Acta* - 1.

There are some inaccuracies in the IF and SJR data presented for the publications.

Publications 12 and 13 are with Q1 (JCR), not Q2. Despite the declaration presented, I cannot accept the utility patent. Three of the presented citations on the articles included in the PhD dissertation are before the defense (two on 2.3 and one on 2.2) and I exclude them from the total number. No evidence has been presented for three of the citations - 4.1, 5.2, and 5.5, but they can be found in the international databases. On the other hand, there are currently more than 60 citations in the Web of Science database that are not included in the competition documents.

Below is an adjusted table of the minimum required points by groups of indicators:

Group of indicators	Content	Minimum for Associate Professor	Candidate	Correction
A	Indicator 1	50	50	50
B	Indicator 2	-	-	-
C	Indicator 3 or 4	100	120	120
D	Sum of indicators from 5 to 10	200	245	230
E	Sum of points in indicators 11	100	144	138
F	Sum of indicators from 12 to the end	100	70	70

The total number of points is 588 with a required minimum of 550.

The presented materials also include 5 participations with oral and poster presentations at national and international conferences. One of them is published in full in the journal *Science and technologies*, 2018, 8 (2), 73-78.

The presented materials fully cover the minimum national requirements for holding the academic position of "Associate Professor".

#### **4. Main scientific and applied scientific contributions.**

The analysis of the scientific contributions of the candidate shows a clearly defined research topic - synthesis and characterization of new ionic liquids as active and stable homogeneous and heterogeneous catalysts for esterification.

Publications 2, 3, 5-8, 11, 12, and 15 describe the preparation of new ionic liquids and the investigation of their composition and structure.

Publications 5, 9, and 14 - studies of the kinetics of thermal decomposition of the obtained ionic liquids.

Publications 5, 6, 13, and 15 present an analysis of surface phenomena occurring in heterogeneous ionic liquids.

Publications 1-6, 10, and 15 describe the use of new ionic liquids as effective catalysts for esterification.

Five new ionic liquids based on pyridine and triazole were synthesized - pyridine hydrogen sulfate (PHS), pyridine dihydrogen phosphate (P2HP), pyridine nitrate (PN), 4-amino-1H-1,2,4-triazole nitrate (ATN) - amino-1,3-thiazole hydrogen sulfate monohydrate (TAHSSM). From them, heterogeneous systems were obtained with carriers with a developed specific surface (activated carbon, alumina, and rice husk ash), which were used as catalysts. Heterogeneous catalysts are characterized by various instrumental methods - X-ray diffraction and X-ray phase analysis, X-ray photoelectron spectroscopy, IR and UV-vis spectroscopy, thermogravimetric analysis, differential scanning calorimetry, adsorption porosimetry. The thermal and catalytic properties of catalysts as a function of their molecular geometry, electronic structure, and intramolecular interactions were studied with the help of quantum chemical (DFT) analysis.

I am fully convinced that Assistant Professor Tankov has a vision for the development of the topic of obtaining and characterizing new active and stable homogeneous and heterogeneous catalysts for esterification.

#### **5. Reflection of the candidate's scientific publications in Bulgarian and foreign literature.**

As noted above, Assistant Professor I. Tankov presented for the competition 72 citations on the works submitted for the competition. Of these, 43 are on the publications included in the PhD dissertation and 29 on those outside it. Given that the publications submitted by the candidate were published after 2017, it is clear that they have yet to find an impact in the scientific literature. This is confirmed by the fact that in the scientific databases can be found more than 60 citations not listed for the competition.

Of the citations of peer-reviewed papers, 1 is in a monograph, and the rest are in international journals. This speaks of the very high quality of the presented scientific publications.

According to the Web of Science, the candidate's h-index is 9.

#### **6. Critical remarks and recommendations.**

I have no comments on the materials submitted for the competition. My recommendation is for Assistant Professor Tankov to pay more attention to the transfer of his rich experimental experience and knowledge, engaging more with the leadership of graduates and in the future of doctoral students.

#### **7. Personal impressions of the reviewer about the candidate.**

I do not know personally the candidate Assistant Professor I. Tankov, but from the presented materials it is evident that he is a scientist with his field of research and characterized by his desire to keep up with modern trends in the development of chemistry.

### **CONCLUSION**

The materials presented in the competition strengthen my conviction that Assistant Professor I. Tankov is a scientist with opportunities for independent and clear and modern approaches to research. All requirements of ADACRB and the Regulations for its application have been exceeded.

I believe that Assistant Professor Ivaylo Tankov covers all legal requirements for holding the academic position of Associate Professor and I strongly recommend the Scientific Jury under this procedure to propose to the Faculty Council of the Faculty of Technical Sciences at the University "Prof. Dr. Assen Zlatarov" - Burgas to appoint Assistant Professor Dr. Ivaylo Georgiev Tankov at the Academic position Associate Professor in the scientific specialty 4.2 Chemical Sciences (Chemical Kinetics and Catalysis).

Date:

March 18, 2022

Reviewer:

(Prof. Dragomir Yankov, PhD)