Opinion

by competition for the academic position of "Associate Professor", professional direction 4.2. Chemical Sciences ("Structural analysis and physicochemical characterization of small organic molecules"), State Gazette no. 95/14.11.2023, for the needs of the department "Structural Crystallography and Materials Science" at IMC-BAS

Candidate: Assist. Prof. Dr. Rusi Ivanov Rusew - IMC-BAS

Member of the scientific jury: Assoc. Prof. Dr. Nadia Lubomirova Petrova - IMC-BAS

This opinion was drawn up on the basis of the order of the Director of IMC-BAN No. 26 RD-09/10.01.2024 and the decision of the meeting of the scientific jury of 25.01.2024. The opinion is in accordance with the requirements of the Law on the Development of the Academic Staff in Republic of Bulgaria (LDASRB), the Regulations for its application (RALDASRB) and the Regulations of the IMC on the conditions and procedure for acquiring scientific degrees and occupying academic positions

1. General presentation of the candidate

Assist. Prof. Rusi Rusew completed his higher education with a master's degree at the University of Chemical Technology and Metallurgy - Sofia in October 2017. Even as a student, he studied and worked at IMC-BAS, where he showed skills and a strong desire for experimental activity (synthesis of organic substances with biological action; purification and crystallization of DNA and proteins) and mastering physico-chemical methods. He defends a PhD thesis on the topic "Synthesis, structural characterization and antimicrobial activity of quaternary ammonium compounds" in the field of "Earth Sciences" (diploma 15.09.2021). From 01.25.2022 until now, he holds the position of Assist. Prof. at IMC-BAS. In the first six months of 2023, he specialized in the "Laboratory of Catalysis and Spectrochemistry (LCS), Ecole Nationale Superieure d'Ingenieurs de Caen (ENSICAEN) in the city of Caen, France, where he mastered new approaches in the synthesis of porous materials as drug carriers. The candidate in the competition copes excellently with other additional commitments as a youth representative in the scientific assembly of IMC, as well as administration of the institute's website.

2. General characteristics of the presented materials

For the presentation in the competition, Assist. Prof. R. Rusew used the Scopus database as an information about the articles and citations. The total number of included publications is 21, and the total number of publication citations, excluding self-citations, is 66. The publications are in categories as follows: Q1 – 7; Q2 – 5; Q4 – 4; in publications with SJR in Scopus, but without IF – 5. Dr. R. Rusew is the first author in one of the presented works and a corresponding author in another. I found no evidence of plagiarism in the scientific works submitted for participation in this competition. According to the available information database Scopus dated of 12.03.2024, there are 23 author documents in his name with *h-index* 4. He is registered in NACID https://ras.nacid.bg/dissertation-preview/69320 in the position of "assistant professor ", and the publications submitted by the candidate for this competition do not repeat those available in NACID, related to the materials for obtaining the educational and PhD scientific degree. During the period 2015-2024, the candidate in the competition was the head of 1 and a participant in 5

projects financed by the Bulgarian National Scientific Fund. During the period 2018-2023, he participated in 6 international or national conferences with international participation. The documents submitted by the candidate for participation in the competition show that he fulfills and significantly exceeds the minimum national requirements for occupying the academic position "Associate Professor" in professional direction 4.2. Chemical Sciences. According to indicator 4 of **group B, 4 publications** published in refereed and indexed journals (WoS and Scopus) are included with a contribution of **100 points**. For group **G, indicator 7** (refereed and indexed journals), **17 publications** carrying **273 points** are presented. In **group D, 66 Scopus citations** with a contribution of **132 points** are presented. Together with the 50 points from the PhD thesis, **the total number of points is 555**. In the certificate of fulfillment of the minimum criteria submitted by the candidate, an understated total of 523 points is indicated. Despite this carelessness, I was left with a very good impression of the overview of the presentation of the competition documents: the attached references, publications, materials from conferences and certificates.

3. **General characteristics of the scientific, scientific-applied and pedagogical activity**

The majority of the publications submitted by the candidate for participation in the competition are related to the topic of the competition, namely ***structural analysis and physicochemical characterization of small organic molecules*** of fundamental scientific importance, as well as applicability in medicinal chemistry. These publications are characterized by a certain presentation pattern: description of synthetic protocols, physicochemical characterization, discussion with specifying properties and potential applications. Different methods are used: single-crystal and powder X-ray structural analysis, thermogravimetry and DSC method, NMR, infrared, UV-Vis in order to determine the molecular structures, crystalline/X-ray amorphous phases and the purity of the substances. X-ray structural monitoring, entirely the work of Dr. Rusew is of primary importance for determining the exact location of atoms, the connections between them and the spatial orientation (or conformation) of molecules in a crystalline state. The author's reference draws attention to the potential applications of a large part of the investigated organic molecules in various fields of medicine: treatment of cancer, Alzheimer's disease, Parkinson's disease, as well as the development of molecules with anti-coronavirus activity. The object of study in three of the publications refers to porous materials: synthesis of titanosilicates for the purification of polluted waters from Pb^{2+} cations (G7.2), as well as the use of titanosilicates as catalysts for the photodegradation of organic dyes (G7. 3); modification of natural habazite for ion exchange applicability (G7.12). More than half of the articles presented in the competition are published in top quartile Q1 and Q2 journals and resonate with the scientific community with their high citations. For the short time of establishing his research career, Dr. Rusew has already led a project funded by the BNSF, as well as a task from the scientific research plan of IMC "Synthesis, structural characterization and biological activity of new quaternary ammonium compounds" (continuation of the PhD thesis topic), evidence to his potential to develop a theme, lead a team and successfully report results. He successfully transferred his skills in activities related to synthesis and working with apparatus to two students.

4. **Basic scientific and scientific-applied contributions**

I fully accept the scientific and scientific-applied contributions of the candidate, Dr. Rusi Rusew, indicated in the author's reference, related to: (i) carrying out the physicochemical characterization of the substances presented in the scientific works through the use of powder and

single crystal structural analysis, thermal studies and spectroscopic methods: more than 50 new crystal structures of various organic materials were solved, specified and described in detail; all structures are deposited in the international database for organic crystalline substances - Cambridge structural database (CSD); thermal stability, phase transitions (if available) and processes related to melting/crystallization have been determined for most of the compounds; (ii) the discovery of new polymorphs with a focus on tracking in tableting, storage, etc. pharmacopoeia characteristics; (iii) the development of new Thioflavin T derivatives related to the search for more specific markers for early diagnosis of Alzheimer's Disease; (iv) establishing a link between structural studies and molecular „docking“ in four protein molecules associated with Parkinson's disease.

Conclusion: The materials submitted for participation in the competition exceed the requirements of the normative documents for occupying the academic position **"Associate Professor**". Dr. R. Rusew masters a number of synthesis techniques related to synthesis of organic substances with biological action as well as drug carrier substances. He is a proven expert in the field of X-ray structural analysis and from personal impressions I would also add thermal analysis. He is actively involved in the scientific and research activities of IMC by leading an independent task in the direction "Structural Crystallography and Materials Science". The review made above and findings in connection with the materials of the competition give me reason to recommend to the members of the Scientific Jury to propose to the Scientific Assembly of IMC, Assist. Prof. Dr. Rusi Ivanov Rusew, to be elected to the academic position of "Associate Professor" in professional direction 4.2. Chemical Sciences ("Structural Analysis and Physicochemical Characterization of Small Organic Molecules") I vote **FOR** his choice without hesitation.

Prepared the opinion:

20.03.2024 Assoc. Prof. Dr. Nadia Petrova