

Opinion

by competition for the occupation of the academic position "Professor" by professional direction 4.4. Earth Sciences (Mineralogy and Crystallography) for the needs of department "Structural Crystallography and Materials Science" at the Institute of Mineralogy and Crystallography - BAS, announced in State Gazette No. 95/14.11.2023

Candidate: Assoc. Prof. Dr. Rositsa Hristova Titorenkova - IMC-BAS

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

This opinion was prepared on the basis of the order of the Director of IMC-BAS No. 28RD09 of 10.01.2024 and the decision of the meeting of the scientific jury of 24.01.2024. 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 the terms and conditions for acquiring scientific degrees and for occupying academic positions at the BAS and the Regulations of IMC on the terms and conditions for acquiring scientific degrees and holding academic positions.

1. General presentation of the candidate

Assoc. Prof. Dr. Rositsa Titorenkova graduated from higher education in 1989, majoring in Geochemistry. in the Faculty of Geology and Geography at the SU "St. Kliment Ohridski". She defended his PhD thesis in 2007 on the topic "Mineralogical features of zircon from Paleozoic metagranitoids in Ograzhden Mountain, Serbian-Macedonian Massif, SW Bulgaria". Currently, she is an associate professor at IMC, scientific secretary and head of the "Spectroscopy" laboratory. Assoc. Prof. Titorenkova is one of the leading specialists in the field of spectroscopic research in our country, gaining skills and experience in a number of prestigious universities: University of Bristol, Great Britain; University of Vienna; Karlsruhe, Germany; University of Bilbao, Spain Bilbao Crystallographic Server; Yamaguchi University, Japan (two-year postdoctoral specialization); University of Hamburg and others.

2. General characteristics of the presented materials

For the participation in the competition, Assoc. Prof. Dr. R. Titorenkova has complied with the criteria in RALDASRB from 18. 03. 2019. Hers scientific metrics include: number of publications - 36, (after receiving the PhD degree and acquiring an academic position "Associate Professor"), of which 10 publications in Q1 quartile journals; 5 – in Q2; 2 – in Q3; 5 – in Q4; 1 post with SJR; 4 – in indexed journals without SJR; 7 publications in non-indexed journals and 2 in books. Assoc. Prof. Titorenkova is the first or independent author in 5 of the works presented for the competition, and in 8 of them she is a corresponding author. According to the data provided by the candidate, the total number of all publications is 82, and the cited publications are 52 with 442 citations noticed. According to the information available in the databases up to 05.03.2024, Assoc. Prof. Titorenkova is a co-author of 35 (SCOPUS) and 40 (WoS) publications and has an h-index of 9. During the period of overall scientific research activity Dr. Titorenkova is a head of three projects and a member of the scientific teams of thirteen others, financially supported by the Scientific Research Fund, National Programs and the European Structural Funds, as well as the head of two international projects and a participant in four other international projects. In the period 2013-2023, Assoc. Prof. Titorenkova reported the scientific results of her research at 31 international or national scientific forums with international participation. Assoc. Prof. Titorenkova is registered in the National Center for Information and Documentation (NACID)

(<https://ras.nacid.bg/dissertation-preview/28104>) with the recognized academic position "Assoc. Prof." from 01.01.2014 as presented by the candidate's publications and citations for this competition do not repeat those available in NACID, related to the materials for obtaining the PhD and for occupying the academic position "Assoc. Prof.". I found no evidence of plagiarism in the scientific works presented for participation in this competition. The documents presented by the candidate for participation in the competition show that she fulfills and significantly exceeds the minimum national requirements for occupying the academic position "Professor" in professional direction 4.4. "Earth Sciences". According to indicator **4** of **group B**, 10 publications published in refereed and indexed journals with a contribution of **112.74 points** are included. For **group G**, indicator 7, 8 and 9, 26 articles carrying **236.54 points** are presented. More than 200 citations (WoS or Scopus) are presented, which carry much more than the **500 points** she mentions for **group D**, and on the indicators of **group E**, evidences for a total of **350 points** are applied (of which 220 points are for the period 2013 - 2023). The total number of points calculated from the submitted documents is **1199.28**, which twice exceeds the required minimum number of points (RALDASRB). In addition, the scientific metrics of the articles presented for participation in the competition cover the minimum requirements for other fields from area 4. Natural sciences, mathematics and informatics: 4.2. Chemical sciences and 4.1. Physical sciences

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

Assoc. Prof. Titorenkova's scientific research activity covers a wide range of studies including structural and crystal chemical characteristics and properties of minerals, biological and synthetic materials by applying the local methods of vibrational spectroscopy. In the last 10 years, it has been an undisputed her leading role in the creation of a direction in IMC for (i) the study of dental hard tissues (degree of crystallinity, isomorphous substitution by carbonate and hydroxyl groups, both water and organic groups content in biological apatite) with the use of micro-IR and Raman spectroscopy. Particularly relevant are the studies of synthetic Ca-phosphates (in a co-authors team) for application in dentistry, as the spectroscopic monitoring of Dr. Titorenkova, is one of the decisive factors in the determination of phase transformations (hydroxylapatite - carbonate-apatite). Another, relatively new subject, (developed in connection with an ongoing project, carried out jointly with the University of Ruse (Razgrad), in which Assoc. Prof. Titorenkova has a leading role, is aimed to (ii) the preparation and characterization of ceramic pigments (with included transition elements- chromophores) with application in sanitary ceramics. The activities related to this direction are related to the planning of syntheses, analytical measurements with the PXRD method, IR spectroscopy, Raman, optical spectroscopy, interpretation and publication of the results. And last but not least I would also like to note the contribution to the publications on (iii) preparation and characterization of new, synthetic heteropolyhedral porous silicates with sorption properties, a contribution related again to the measurement and interpretation of infrared and Raman spectra.

Although she is a representative of the non-teaching part of the scientific community, Assoc. Prof. Titorenkova is also involved in active pedagogical activities: spectroscopic courses for PhD students, lectures for students in the "Geochemistry" specialty, supervisor of students in the "Student Practices" program, supervisor of a PhD student dismissed with the right of defense. Assoc. Prof. Titorenkova would be an excellent PhD student supervisor considering her rich research experience and ability to communicate with young people, which I recommend you in her future work.

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

I would like to emphasize the main scientific and scientific-applied contributions of Assoc. Prof. Titorenkova in the three above-mentioned directions of her research activity, namely: (i) obtaining new data, through micro IR and Raman spectroscopy, for the structural non-homogeneities of the apatite forming the dental enamel from the surface to the dentine border in depth, as well as the determination of the safe parameters for working with a dental laser without affecting the structure of the biological apatite; establishing how hydroxylapatite is transformed into carbonate-apatite; (ii) establishing the compositions and synthesis parameters at which ceramic formation is expected, as well as establishing the influence of isomorphous substitution on the phase, structural and optical characteristics and on the color of the ceramics; (iii) obtaining new spectroscopic data for newly obtained heteropolyhedral, porous silicates with potential properties. In all publications presented in the competition, the candidate's contribution is clearly visible and distinguishable, and all authorship claims for contributions indicated by her in the individual fields are fully justified.

Conclusion: The materials presented for participation in the competition exceed the requirements of the normative documents for occupying the academic position "**Professor**". Assoc. Prof. Titorenkova is a recognized scientist - expert in the field of spectroscopic methods and her scientific and applied developments are an important part not only of the scientific research of IMC, but also for the mineralogical and crystallographic communities in the country and abroad. The above review and findings in connection with the competition materials give me reason to recommend to the members of the Scientific Jury to propose to the Scientific Assembly of IMC that Assoc. Prof. Dr. Rositsa Titorenkova be elected to the academic position of "**Professor**" in a professional field 4.4. "Earth Sciences", majoring in Mineralogy and Crystallography, and I strongly vote **FOR** her choice.

17. 03. 2024

Prepared the opinion:

Assoc. Prof. Dr. Nadia Petrova