

## OPINION

according to competition for the academic position of “Professor”  
in the scientific field 4.4. Earth Sciences (mineralogy and crystallography) in Institute of  
Mineralogy and Crystallography – BAS,  
announced in the "State Gazette", no. 95 / November 14, 2023

**Candidate:** Associate professor, PhD, Rositsa Hristova Titorenkova, IMC - BAS

**Member of the Scientific Jury:** Professor, PhD, Tsveta Stanimirova Ivanova, Faculty of Geology and Geography, Sofia University “St. Kliment Ohridski”

The opinion was prepared in accordance with the order of the Director of IMC-BAN 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 the Republic of Bulgaria, the Regulations for the terms and conditions for acquiring scientific degrees and for occupying academic positions at the BAS (RTCASDOAP-BAS), and the IMC Regulations on the terms and conditions for acquiring scientific degrees and holding academic positions from 21.10.2021.

### 1. General presentation of the candidate

Associate professor Dr. Rositsa Titorenkova graduated from higher education with the qualification of geologist-geochemist in 1989, majoring in "Geology" at the Faculty of Geology and Geography at SU "St. Kliment Ohridski". In 2007, she obtained the PhD degree of the National Academy of Sciences with the topic "Mineralogical features of zircon from Paleozoic metagranitoids in Ograzhden Planina, Serbian-Macedonian Massif, SW Bulgaria". The development of her scientific qualification has continued in a number of prestigious universities: the University of Bristol, Great Britain; University of Vienna; Karlsruhe, Germany; University of Bilbao, Spain Bilbao Crystallographic Server; Yamaguchi University, Japan (two-year post-doctoral specialization); The University of Hamburg and others. Currently, she is an Associate professor at IMC-BAS, scientific secretary and head of the "Spectroscopy" laboratory.

### 2. General characteristics of the presented materials

From the data provided by the applicant, the total number of all publications is 82, with cited publications being 52 with 442 citations. According to the information available in the databases as of 03/05/2024, Assoc. Prof. R. Titorenkova is a co-author of 35 (SCOPUS) and 40 (WoS) publications and has an *h*-index of 9. In the competition, Assoc. Prof. R. Titorenkova participated with 36 publications, published after receiving the PhD degree and acquiring the academic position "Associate Professor". Of these, 10 publications are 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. R. Titorenkova is the first or independent author on 5 of the works presented for the competition. Assoc. Prof. R. Titorenkova is the head of three and a member of 13 projects financed by the Scientific Research Fund of the Ministry of Education and Culture, National Programs and European Structural Funds. She is the head of two and a participant in four other international projects. For the last 10 years, Assoc. Prof. R. Titorenkova has reported the

scientific results of her research at 31 international and national scientific forums. Assoc. Prof. R. Titorenkova is registered at the National Center for Information and Documentation (NACID) (<https://ras.nacid.bg/dissertation-preview/28104>) with the recognized academic position of "associate professor" from 01.01.2014. The publications presented by the candidate and the citations for this competition do not repeat those available in NACID, related to the materials for acquiring the educational and scientific degree "doctor" and for occupying the academic position "associate professor".

The submitted documents of the candidate for participation in the competition show that Associate Professor, PhD, Rositsa Titorenkova fulfills and significantly exceeds the minimum national criteria presented in the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its application dated 18.03.2019 for occupying the academic position "professor" in professional direction 4.4. "Earth Sciences". The included 10 publications in refereed and indexed journals according to indicator 4 of group B are evaluated with 112.74 points. The presented 26 articles under indicators 7, 8 and 9 (group D) carry 236.54 points. More than 200 citations presented carry more than 500 points for Group D. Evidence for Group E indicators is valued at 350 points. The total number of 1199.28 points is twice the required minimum of points according to the Law on the Development of the Academic Staff in the Republic of Bulgaria, the RTCASDOAP-BAS.

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

Assoc. Prof. Rositsa Titorenkova is one of the most prominent specialists in vibrational spectroscopy, which is a prerequisite for the development of her scientific and scientific-applied activities in the study of various materials for solving mineralogical, medical and other problems. The scientific interests of Associate Professor, PhD, R. Titorenkova are in the field of structural and crystal chemical characteristics and properties of minerals, biological and synthetic materials. The active research activity of Assoc. Prof. R. Titorenkova has created three important thematic areas of research in the IMC of the BAS with practical application in:

- *Dental medicine*. Spectroscopic monitoring of phase transformations (hydroxylapatite - carbonate-apatite) was created based on studies of synthetic Ca-phosphates. Dental hard tissues (degree of crystallinity, isomorphous substitution of carbonate and hydroxyl groups, water content and organic groups in biological apatite) were investigated with micro-infrared and Raman spectroscopy.
- *Sanitary ceramics*. Ceramic pigments (with included transition elements-chromophores) with application in sanitary ceramics have been obtained and characterized.
- *Sorption*. New, synthetic heteropolyhedral porous silicates with sorption properties were obtained and characterized.

Assoc. Prof. R. Titorenkova imparts her knowledge in the field of vibrational spectroscopy with an active pedagogical activity: organizer and lecturer of courses on spectroscopic methods for doctoral students at the BAS Training Center, invited lecturer in the specialty "Geology", SU "St. Kl. Ohridski"; supervisor of students under the "Student Internships" program, supervisor of a PhD student dismissed with the right of defense.

### 3. Basic scientific and scientific-applied contributions

The scientific and scientific-applied contributions of Assoc. Prof. R. Titorenkova are numerous, the most important of which are:

- obtaining new data on the structural inhomogeneities of the apatite making up the dental enamel from the surface to the dentin border in depth by means of micro-infrared and Raman spectroscopy;
- determining the safe parameters for working with a dental laser without affecting the structure of biological apatite;
- establishing the way in which hydroxylapatite is transformed into carbonate-apatite;
- establishing the compositions and synthesis parameters of ceramics with desired properties;
- establishing the influence of the isomorphic substitution of pigments on the phase, structural, optical characteristics and color of ceramics;
- obtaining new porous silicates;
- obtaining new spectroscopic data for the newly obtained heteropolyhedral, porous silicates with potential sorption properties.

I support the provided author reference for the contributions, since the scientific contribution of Assoc. Prof. R. Titorenkova in the individual publications is clearly visible and distinguishable, and all the author's claims for contributions indicated by her in the individual fields are fully justified.

**Conclusion:** The documents, publications, participation in projects and citations presented by candidate in the competition exceed the minimum national requirements provided in the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for it.

The developed current research topics, the high level of the conducted scientific research, define Assoc. Prof. Rositsa Titorenkova as an outstanding scientist and expert in the field of vibrational-spectroscopic methods. Its scientific and applied developments are important for not only mineralogy and crystallography, but also for solving important problems of dentistry and industry.

Based on the arguments presented to the members of the Scientific Jury, I will vote positively, and they give me reason to confidently recommend to the members of the Scientific Jury to propose to the National Assembly of IMC that Assoc. Prof., PhD, Rositsa Titorenkova be elected to the academic position of "Professor" in professional direction 4.4. Earth Sciences (Mineralogy and Crystallography).

17 March 2024  
Sofia

Reviewer:  
Prof. Tsveta Stanimirova, PhD