

CRITICAL REVIEW

on a competition for the academic position "Professor" in a professional field 4.4. Earth Sciences (Experimental mineralogy and crystallography), for the needs of the department "Experimental Mineralogy and Crystallography" at IMC-BAS, published in the State Gazette No. 62/14.07.2020

With Candidate Associate Professor Dr. Vladislav Vladimirov Kostov, Institute of Mineralogy and Crystallography, BAS

Prepared by Professor Dr. Mihail Pavlovitch Tarasov (Member of Jury), Institute of Mineralogy and Crystallography, BAS

1. General characteristics of the presented materials

To participate in the competition, the candidate has submitted 32 articles and conference papers, of which 3 are in Bulgarian and 29 are in English; 22 articles are with impact factor - 10 in Bulgarian journals and 12 in international journals; 10 articles are in journals with the highest scientific rank for journals - Q1, according to Scimago Journal Rank (SJR), 5 articles - with Q2 and 7 articles - Q4.

In 1 article (in Bulgarian) the candidate is the only author. The remaining 31 publications are co-authored with other researchers: 6 publications - 2 authors, 6 publications - 3 authors, 6 publications - 4 authors, 13 publications - 5 and more authors. In 16 publications the candidate is in first place, in 17 publications the candidate is indicated as the author for correspondence, which can be considered as an indication of the leading role of the candidate in the research.

According to the candidate's documents, the total number of citations of publications with the candidate's participation for the period 2006-2019, after the holding the academic position "Associate Professor", is 241 (including crystallographic cards from the world databases for powder diffraction - ICDD and for crystal structures of inorganic materials - ICSD). The personal calculated h-index is 10. The number of citations reported in the world bibliographic and reference databases - Scopus and Web of Science, is 142 at h-index = 8.

All materials submitted by the candidate for participation in the competition - list of publications, publications themselves, citations, participation in projects and scientific forums, show that the candidate meets or exceeds the minimum requirements for the academic position "Professor", according to "Regulations for acquiring scientific degrees and for occupying academic positions at IMC-BAS".

2. General characteristics of the scientific, scientific-applied and educational activity of the candidate

The scientific activity of the candidate is developed in three main research areas: **(1) low-temperature hydrothermal synthesis** up to 200°C (soft chemistry) of new materials with potential functional properties: titanosilicates, zirconosilicates (including glaserite type phases), stanosilicates, water-containing sodium silicates) and others; **(2) structural and crystal chemical characteristics** of synthesized phases, modified phases (ion exchange, heat treatment, mechanoactivation) and functional materials obtained in external laboratories (sodium manganese sulfates, sodium cobalt-manganese sulfates for alkaline-ion batteries) by applying X-ray diffraction analysis (phase identification, quantitative phase analysis, refinement and solution of

structures by the Rietveld method); **(3) investigation of minerals and mineral diversity of Bulgaria** (preparation of systematic work on minerals in Bulgaria).

The candidate's research activity includes participation in the development of 13 research projects since 2003, including 8 international projects and 5 projects funded by the NSF at the Ministry of Education and Science. Of the 8 international projects, 4 are related to bilateral scientific cooperation between the Bulgarian Academy of Sciences and the Estonian Academy of Sciences and the Czech Academy of Sciences; 2 projects are funded by the Ministry of Education and Science for bilateral cooperation Bulgaria-Ukraine and Bulgaria-Russia; 2 projects are funded under the Operational Program for European and Territorial Cooperation Greece-Bulgaria. In 3 projects the candidate is a leader.

The candidate's scientific and applied activities may include his participation in projects with a practical focus, such as "Risk management of natural and anthropogenic landslides in the Greek-Bulgarian cross-border region" and "Chemical and radiological risk in the indoor environment" to the Operational Program for European and territorial cooperation Greece-Bulgaria, as well as applied tasks with external customers, such as a study of the yellow paving stones of Sofia (composition, properties, method of obtaining) with an ordering customer - Sofia Municipality.

The candidate was not the supervisor of a successfully defended doctoral or master's degree. However, my observations show that the candidate actively shares his experience in synthesis experiments with young scientists at IMC-BAS. Associate Professor Dr. V. Kostov, in my opinion, has played a very important (if not basic) role in the training and successful defense (2004) of the dissertation of full-time PhD student St. Ferdov, who currently has a very serious scientific realization.

3. Main scientific and/or scientific-applied contributions with an assessment of the personal participation of the candidate.

The main contributions of the candidate fit very well into the above 3 areas in his research.

- The research area "**low-temperature hydrothermal synthesis**" is possibly the most important scientific-experimental activity of the author, which finds its realization in publications in journals with high scientometric indicators (impact factor, Q-rank), which is further multiplied in the large number of citations (e.g. work (14) has 25 citations). Publications [2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 17, 20, 23, 28] belong to this research area. All these publications are made by teams with many authors. I see the main contribution of the author in these publications in the strategic planning, organization and implementation of synthetic experiments for obtaining titanosilicates with microporous, layered and dense structures; zirconosilicates (phases with glaserite structures, layered structures), tin silicates and other phases. I see the other part of the author's contribution in the following area.

- **Structural and crystal chemical characteristics** of the obtained materials by applying powder X-ray diffraction analysis and using various software packages, including those for refining and solving structures by the Rietveld method (works [6, 8, 12, 13, 14, 18, 20, 21, 22, 23, 32]). I see the main merit of the candidate not in the development of these methods (the candidate is not a crystallographer-theorist and is not a programmer), but in their deep acquirement and competent application of software packages for refining and solving structures.

- One of the important research areas developed by the author is **the study of minerals and mineral diversity of Bulgaria** (publications [11, 16, 26, 30, 31]). So far, this area does not have significant scientometrics, but it has great prospects and importance as a benefit for the state. The candidate has been dealing with this problem for years and can now present a really functioning electronic information product - an electronic bibliographic database of minerals in Bulgaria. In the future it is expected to publish a complete contemporary monograph on the mineral diversity of Bulgaria. The activity in the field is carried out with the leading role of the candidate.

4. Critical remarks and recommendations on the submitted works

I have no significant remarks on the candidate.

5. Motivated and clearly formulated conclusion

The review of the scientific papers and citations, the attached information for participation in projects and the author's summary for the scientific contributions, as well as my personal impressions give me reason to believe that Assoc. Prof. Dr. V.V. Kostov fully deserves to take the academic position of "Professor" at IMC-BAS.

11.11.2020 г.

/Prof. Dr. M. Tarassov/