

REVIEW

on a competition for the academic position of "professor"
professional field 4.4. Earth sciences (Experimental mineralogy and crystallography)

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Candidate: Assoc. Prof. Dr. Vladislav Vl. Kostov-Kitin, IMC-BAS

Reviewer: Prof. Dr. Thomas N. Kerestedjian, GI-BAS

1. General description of the presented materials

The candidate applies in the competition for a professor with 32 publications, which are not included in the procedures for meeting the requirements for acquiring the educational and scientific degree "Doctor" and for holding the academic position "Associate Professor". Two of the publications are surveillance works, 22 are in journals with impact factor (11 in international journals and 11 in national journals), 10 articles Q1 (SJR) (one tops rankings), 5 articles Q2 (SJR), 7 articles Q4. In 1 article he is a single author, 6 - with two authors, 6 - with three authors and the rest with more authors. First or corresponding author he is in 18 articles.

I see no reason to reduce the proposed publications and I accept all for a review.

It is evident, both from the reference for compliance with the minimum national criteria and from the presented factual material that the quantitative indicators of the requirements of IMC-BAS for holding the academic position are covered and significantly exceeded, namely:

- Indicator A: Covered under the eligibility conditions in the competition.
- Indicator B: Uncovered. Not required.
- Indicator C: Publications 10 pcs. (required). Points 178 at required 100.
- Indicator D: Points 232.75 at 220 required.
- Indicator E: Points 710 for 120 required.
- Indicator F: Points 285 at 150 required.

Unlike other natural sciences, for the Earth Sciences the law adopted a methodology for scoring the publication activity, which does not take into account the citation rate of the publication (quartile division). As I consider this exception to be a victory of scientific mediocrity, and also because the candidate's research activity is in a field bordering on Earth Sciences and Structural Chemistry, I consider it important to emphasize that the candidate meets the requirements of both scoring methods. The points for indicators C and D, calculated according to the scoring methodology for the field of chemical sciences (by quartiles) are 222 and 212, respectively.

It is obvious, but I will note for completeness that the author meets all the criteria for eligibility in the competition, as evidenced by higher education diplomas, doctoral and scientific degrees, the certificate of academic position "Associate Professor", the official note for work experience, medical certificate, criminal record.

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

The candidate is a scientist with a strong research attitude. Whether the activity of the candidate is more scientific or rather applied-scientific is difficult to say, because the materials he synthesizes and/or characterizes have a significant application in various technological fields. However, I would

say that the candidate's contributions are rather scientific, as I do not see in the materials provided data on typical implementation activities.

If the main field of research of the candidate had to be defined in one sentence, it would be *synthesis and characterization of technologically important materials with or without natural analogues*. Regarding the synthesis presented in the candidate's works, I prefer not to take a stand, as I expect my colleagues from the chemical disciplines to do this much more competently than me. Regarding the characterization of the crystalline substance, however, I can confidently say that the candidate is a leading specialist in the structural characterization of crystalline materials. He is one of the few researchers in our country applying the Rietveld method, not only for crystal structure refinements (which is its most common application), but also for quantitative phase analysis, determining the size and shape of crystallites, stress and strain in material. For this purpose, he uses several software products, which is normal for those working with Rietveld, because each of the software products has advantages and disadvantages, and solving specific problems often requires trying more than one software. However, the applicant prefers and masters the GSAS product very well. This fact is a value for the guild, because it is important for each of the software packages to have someone who knows it better than the others and can play the role of Guru in relation to this package. For GSAS, this guru is Assoc. Prof. Kostov.

The recommended structure of the review in the IMC requires me to take into account the applicability of the characteristics "organizer" and "promoter" to the personality of the candidate. Personally, I have never found the above two characteristics particularly prestigious, but I have had the opportunity to be convinced (from the BCD events) that the candidate handles organizational tasks easily and elegantly, without having his research work affected. This is a talent that I envy nobly. Regarding the "promoter", I am not convinced that this is the right place to note, but I want not to miss a very important activity of the candidate, representing a value for the domestic mineralogical community - the bibliographic database of minerals in Bulgaria, which the candidate develops practically himself. To date, this database contains a significant array of data (3600 records) and is a treasure for both our scientific community and the training of students in geological specialties.

There is no, or at least I am not aware of, any pedagogical activity in the candidate's career. Although pedagogical activity is not a mandatory requirement for scientists in the field of research, I see this lack as a shortcoming and I will recommend the candidate to make up for missed opportunities in the near future. Of course, the most important thing for a researcher is to gain knowledge and experience that will bring him to the forefront in the field in which he works, but I also think that it is no less important to pass this experience on to the next generation of researchers.

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

Assoc. Prof. Dr. Vladislav Kostov-Kitin is the author of a total of 71 scientific publications (articles and reports), 49 of which in renowned referenced and indexed publications with scientific reviewing, 42 of which are in publications with impact factor. Some of the other 22 publications, (mainly in proceedings of scientific conferences and symposia), are also peer-reviewed.

In more than half of the publications (40), he is clearly the author writing the main text: single author, first author, corresponding author. In all cases, the role of the candidate in the authors team is clearly highlighted and significant.

The established and indicated in the author's reference citations are 218, searched by all sources. This does not include the results deposited in databases (23), which I think should more be viewed not as citations, but as a specific form of publications, because as any normal publication they

provide the scientific community with data usable in subsequent research. In addition, the data in these databases are cited and will be cited in the future by all who will use them. The number of citations of the candidate, according to the platforms Scopus and Web Of Science is less - 142, because these platforms look for citations only in their own sources of information, but this is a problem of the respective platforms and not of the candidate.

The significant predominance of internationally visible publications is logically reflected in the fact that the candidate's Hirsch index (8) is the same in different platforms (Scopus, Web of Science, Research Gate), as the same set of equally visible publications for all platforms also forms the mass of citations. Low-visibility publications (mostly those in conference proceedings) have little effect on citation scores.

The value of the Hirsch index itself (8) is also quite decent for the field of earth sciences. In fact, in my opinion, the candidate's index should be considered 9, as determined by data from Google Scholar. The difference from other platforms comes from the fact that Google's search algorithms are more efficient than all the others. Google Scholar searches for all possible sources of information, while Scopus and Web of Science only in their own publications. Since, by definition, the Hirsch index is formed by the number of citations per publication, not by the edition of the citation, it is logical to trust Google Scholar.

3. *Main scientific and/or applied-scientific contributions*

Assessing the candidate's scientific contributions is a very difficult task, not because they are not clearly worded, but because there are many, and a full list and comments on them would make this review a stand-alone scientific study. Each of the publications proposed for the competition contains several significant contributions. Fortunately, the candidate has offered a perfect, well-structured author's reference, which indisputably answers the questions posed in this section of the review: to what extent the contributions are the work of the candidate; for each contribution - where it is contained. For each publication, the answers to these questions are clearly visible in a special paragraph at the end of the respective publication (this is often an editorial requirement of renowned issues) or in an attached (in the competition materials) distribution protocol signed by all co-authors.

To list, repeating the author's reference, all the candidate's contributions would be foolish and annoying. Instead, I took the trouble to carefully read the publications attached for the competition and to make sure that author's claims for the declared contributions were completely justified. I am grateful to the crown-virus, which gave me enough free time for this reading, because for a person with scientific interests in this field, the candidate's publications turned out to be a really fascinating read.

However, in order not to be unsubstantiated, I will highlight some of the contributions that I find most important, with the proviso that the contributions related to synthesis procedures (new phases for the science, fields of crystallization of industrially important phases, etc.) I leave to the colleagues from the chemical guild:

- Paper 12 describes the synthesis and characteristics of a new for the science water-containing zirconosilicate phase with a dense glazerite type structure. Apart from being the only known case of a water-containing variant of this type of phase, the work impresses with the use of the whole arsenal of means for solving and refining crystal structures extremely competently and with deep understanding applied to a difficult to solve phase, with phase transition during synthesis and invisible to X-ray diffraction hydrogen. Well-deserved, ICDD (2014) issues a certificate of excellence.

- In papers 23 and 32 a specific methodological approach is applied in structure refinement, allowing the study of the flexibility of the walls of the channels of the skeletal structure of the phases. It consists in the introduction of a very high weighting factor and at the same time a low value of the deviation from the set values of the distances between the cations of the skeletal structure and the oxygen from their polyhedral environment (definition of solid polyhedra). This allows the procedure to focus on refinement, which preserves the crystal chemical reliability (interatomic distances and angles in the polyhedra) and at the same time to focus on the deformations of the space between them. In addition to clarifying the thermal behavior of the studied phases, the works have significant methodological contribution.
- Works 20, 21 propose a modern approach for the evaluation of microstructural features (size of coherent scattering domain, microstrain) of the apatite type material, treated by heating and milling. FullProf program was used, which offers various anisotropic models for the best interpretation of the experimental results, based on the integral broadening of the reflexes of the processed material. The results are interpreted according to the latest understandings of crystal-structural imperfections and crystal growth at the micron-, submicron and nano-dimensional levels. The results of such studies can have important application to practice .
- Paper 15 is a surveillance study focused on the crystal chemistry and systematics of glazerite type crystal structures. Crystal chemical data for more than 100 compounds with glazerite type structure (GTS) and chemistry, covering more than 45 chemical elements from the periodic table, are summarized. The data were used for precise structural definition and general chemical formula for these materials. Geometric criteria for estimating the topological flexibility of GTS have been introduced and based on the cases observed so far, the range of their crystal-structural stability has been described. The work is collective, but the role of the candidate is very clear.
- Behind works 11 and 16 is a really functioning electronic information product - an electronic bibliographic database of minerals in Bulgaria (EBBDMB). They contain details on the structure and functions of this product, strengths and weaknesses, sources of replenishment, development perspectives, and specific information on its contents. As of July 2020 annually supported EBBDMB contains over 3600 entries, with more than 80% of them containing lists of mineral names, studied, described, listed, and so on. More than 1500 mineral species and varieties have been registered, which include over 800 mineral species, approved as independent and reliable at the moment by the International Mineralogical Association. The results of many years of work in this direction empower and are an excellent precondition for such areas in our mineralogical science, which require new testing, inspection work and new definitions of mineral projects in the light of measures taken over the past 20 years of the International Mineralogical Association changes in the nomenclature and classification of mineral species.
- In the surveillance work 30 the crystal chemical features of the minerals from the group of tetrahedrite are considered as a prerequisite for their role as indicators for the formation environment. Special attention is paid to the silver-containing representatives, because such are over 60% of the Bulgarian tetrahedrites and because the recently adopted by the International Mineralogical Association changes in the nomenclature and classification of the group most sensitively affect them and their relation to a series, mineral species or variety. The achievements of the Bulgarian mineralogical science in the study of tetrahedrites are briefly presented, as various aspects are illustrated, illustrating the researchers' efforts to cover, as well as possible, the diversity of these minerals and the possibilities to extract various crystal chemical, geochemical and other mineralogical information. In the light of the changes, already published data from 450 electron-probe microanalysis of samples from 45 deposits, distributed in three metallogenic zones in the country, were processed. Based on

the processed data, two new mineral species for Bulgaria can be indicated: kenoargentotetrahedrite-(Fe) from Chiprovtsi and argentotetrahedrite-(Fe) from Bakhteritsa.

6. Critical remarks of the reviewer on the submitted works, incl. and on the literary awareness of the candidate.

I have no critical remarks, and this should not come as a surprise, because it refers to a researcher who publishes mainly in renowned international scientific sources, where everything that deserves criticism is noticed by highly qualified reviewers and shortcomings are removed before publication.

7. Motivated and clearly formulated conclusion.

The candidate is a fully built scientist with indisputable qualifications and abilities. Both his research qualities and his organizational skills characterize him as a very suitable candidate for the professor's position in IMC. I believe that the IMC staff can only benefit from the election of a professor in his person and I recommend the esteemed Scientific Council to make this choice. My motivation for this conclusion is based on the facts set out above, which are eloquent enough in themselves.

Date: November 10, 2020.

Reviewer:

T. Kerestedjian