

R E P O R T

on the competition for the academic position Professor scientific direction 4.4. Earth sciences (Experimental mineralogy and crystallography)

Institute of Mineralogy and Crystallography at the Bulgarian Academy of Sciences
(IMC-BAS)

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Applicant: **Assoc. Prof. Dr. Vladislav Vladimirov Kostov** (IMC-BAS)

Member of the Scientific Jury: Prof. Dr. Radostina Konstantinova Stoyanova (IGIC-BAS)

A. Short professional biography

Dr. Vladislav Kostov is the only candidate in the competition announced by IMC-BAS for the academic position Professor on Earth Sciences (experimental mineralogy and crystallography). He is a master of the Moscow Geological Research Institute, where he graduated as a geological engineer. In 1995 he successfully defended his PhD thesis on the synthesis and crystal chemistry of lead-antimony chlorosulfate salts at the Faculty of Geology and Geography of Sofia University. The good education and training of Dr. Kostov are the basis of his successful realization in IMC-BAS, where he started working in 1990. In 2005 he was habilitated in IMC-BAS as a senior research, equated to associate professor in accordance with the law from 2010. In addition to scientific activities, Dr. Kostov performs a number of administrative tasks as head of the scientific direction "Experimental Mineralogy and Crystallography" since 2012 and as deputy director since 2015. This report clearly shows that the scientific activity of Dr. Kostov fully complies with the requirements of the competition for a Professor of Earth Sciences announced at IMC-BAS.

B. Report on the fulfillment of the minimal criteria of BAS

Dr. Kostov is a co-author of a total of 71 scientific publications. He participated in the competition for a professor with 10 scientific publications, summarized as a habilitation thesis. They are devoted to the preparation of synthetic analogues of titanium, zirconium and tin-containing silicate minerals, as well as to the refinement of their structures. It is noticeable that six of the publications (i.e. 60%) were published in peer-reviewed journals from the first quartile in the corresponding field. Along with them, Dr. Kostov presents 22 scientific papers, which demonstrate a comprehensive approach to elaborating an electronic bibliographic database of minerals in Bulgaria. In addition, some thermal and functional properties of synthetic phases with potential application in high-tech fields have been studied. Dr. Kostov distributed some of the research results to the scientific community (a total of 36 participations), 9 of which are in the form of oral presentations. It should be noted that Dr. Kostov also participates in the training of young scientists in the field of X-ray diffraction, and in 2019 he gave lectures and conducted exercises with the participants of the II School "Introduction to X-ray Diffraction". The successful development of the research activity of Dr. Kostov between 2006 and 2019 is directly related with his active participation in projects (17

in total) with various sources of funding, such as NSF, Operational Programs, MES, three of them are essential and he is a leader. Dr. Kostov's studies have found a wide response in the research community, and between 2006 and 2019, 241 independent citations were noticed on all his publications. Importantly, some of these citations also include worldwide databases on powder diffraction and crystal structures of inorganic materials.

The report's data revealed that the scientific output of Dr. Kostov is on the topic of the competition and meets the minimum national requirements for holding the academic position of "Professor" in the field of 4.4. Earth Sciences (Experimental Mineralogy and Crystallography), specified in the Law for Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its application and the Regulations for the conditions and the order for acquiring scientific degrees and holding academic positions in BAS

C. General features of the applicant's research activities

C1. Main scientific contributions presented in the habilitation thesis. The synthesis and characterization of synthetic analogues of microporous minerals is a scientific task with an impact on the development of various application areas related to energy storage, clean environment and better life. This area includes the research of Dr. Kostov, namely the formation and crystal chemistry of microporous silicates containing titanium, zirconium and tin. Based on a detailed structural analysis by the Rietveld method, several new phases with structures hitherto unknown in the literature, such as crystal hydrates of zirconium and tin silicates, have been identified. A manifestation of this are the introduced X-ray structural parameters of the phases in their reference cards in the two most reputable databases: a total of 11 cards for 8 compounds in the PDF of the ICDD (until 2015) and 4 pieces in the ICSD database (until 2010). The extracted correlations between the physicochemical parameters of synthesis and the structure of the obtained phases help to determine the areas of crystallization - information needed to target preparation of phases with a given composition, pore size and morphology of the crystallites.

In conclusion, Dr. Kostov's investigations on microporous silicates of titanium, zirconium and tin are an indispensable part of the overall circle of complete research of these important materials for practice, as the originality consists in clarifying their crystal chemical peculiarities.

C2. Scientific contributions presented in the non-habilitation thesis. Research in this group is focused on studying the thermal, ion exchange and catalytic properties of zirconium silicates. A main feature of the research is the understanding of the properties of silicates from the point of view of the accumulated knowledge on their structural features. The significance of all these studies is most fully illustrated in the developed systematics of compounds with a glazerite-type structure in terms of chemical composition and structural characteristics. An important achievement of Dr. Kostov is the elaborated electronic information product, containing an electronic bibliographic database of minerals in Bulgaria with over 3600 records. This is an important initiative for the country, which is a continuation of the ideas of the recognized Bulgarian scientists I. Kostov, V. Breskovska, J. Mincheva-Stefanova and G. Kirov, reflected in the book "Minerals in Bulgaria" published in 1964.

All presented research was carried out in a team with scientists from IMC-BAS and other scientific organizations, and the role of Dr. Kostov is well defined: he participates in the implementation of scientific tasks for synthesis and structural characterization of phases, and in the formulation of new directions in the development of research.

D. Conclusion

The main features of the overall research activity of Dr. Kostov are the systematic and purposeful study of microporous silicates as synthetic analogues of minerals. The conducted research clearly outlines the contribution of Dr. Kostov, namely the identification of new correlations between the synthesis conditions and the crystal chemical peculiarities of the synthetic phases. An important part of Dr. Kostov's research is dedicated to the systematization of the mineral diversity of Bulgaria - an activity with a huge future effect. Dr. Kostov's scientific output exceeds the minimum national requirements for holding the academic position of "Professor" in the field of Earth Sciences. All this gives me reason to propose most convincingly to the Scientific Jury to award Assoc. Prof. Dr. Vladislav Kostov the academic position of "Professor" on Experimental Mineralogy and Crystallography.

11.11.2020 г.

Radostina Stoyanova