STATEMENT

on the competition for the academic position "Associate Professor"
in the professional field 4.2. Chemical sciences (Inorganic chemistry),
announced in the State Gazette no. 47/04.06.2021
by the Institute of General and Inorganic Chemistry-BAS
for the Laboratory of High Temperature Oxide Materials

Reviewer: Prof. Dr. Ekaterina Zhecheva from the Institute of General and Inorganic Chemistry of the Bulgarian Academy of Sciences

Brief Biography of the Applicant and General Characteristics of the Research Activity

One candidate - **Assistant Professor Dr. Margarita Kirilova Milanova** from IGIC-BAS - participates in the competition for the selection of an Associate Professor in the professional field 4.2 Chemical sciences (Inorganic chemistry) announced by the Institute of General and Inorganic Chemistry of the Bulgarian Academy of Sciences (IGIC- BAS) in SG No. 47/04.06.2021 for the Laboratory of High Temperature Oxide Materials at IGIC.

Assistant Professor Dr. Milanova graduated in the year 1997 from the Faculty of Chemistry (at present Faculty of Chemistry and Pharmacy) of the Sofia University "St. Kliment Ohridski" as Magister in Chemistry qualified in Chemistry, Chemistry Teacher with a Second Specialty Physiscs. The academic career of Dr. Milanova took place at IGIC - BAS, where in 2000 she was enrolled as a full-time PhD student in Inorganic Chemistry under the supervision of Prof. DrSci Yanko Dimitriev and Academician Dimitar Klissurski. In 2005 she defended her PhD thesis entitled "Synthesis and characterization of amorphous and polycrystalline molybdate materials". In the same year she was selected as a Research Fellow 2nd degree at IGIC, and in 2008 she is was promoted to a Research Fellow 1st degree (Assistant Professor). Dr. Milanova had specialization grants in Turkey and Japan.

Assist. Prof. Milanova has co-authored a total of 42 articles, 30 of them being in Impact Factor or Impact Rank journals. According to the candidate, the total number of citations for all the scientific papers is 151, and her Hirsch factor is 7. Her scientific interests are in the field of the synthesis and characterization of oxide glasses with the participation of non-traditional network formers as well as in developing of new synthesis methods for materials based on transition metal oxides.

Description of the Submitted Documents

The applicant participates in the competition for Associate Profeessor with 19 publications. The publications included in the habilitation work are 8, of which 3 are published in first quartile journals (Q1), 1 – in Q2 journal and 4 in Q4 journal. The publications beyond habilitation work are 11, with 5 in Q1 journals, 2 in Q2 journals, 3 in Q3 journals and 1 in Q4 journal. The journals where she has published most often are Journal of Non-Crystalline Solids with an impact-factor IF_{2020}=3.531 (8 papers) and Journal of Materials Science with IF_{2020}=3.553 (3 papers). 99 independent citations were noted on the publications

of this competition (Web of Science and/or Scopus), 58 of which belong to the papers of the habilitation work.

Assist. Prof. Margarita Milanova has participated in total 46 scientific forums in Bulgaria and abroad. After the acquisition of her PhD degree she participated in 28 scientific forums, 28 of which are international.

The applicant was team-member of 7 projects with national funding.

All documents presented by Assist. Prof. Milanova fit the topic of the competition.

A check up is presented for the compliance of the scientific asset of the applicant with the requirements of the Institute of General and Inorganic Chemistry – BAS specified in its Regulations for the Terms and Conditions for Acquiring Academic Degrees and Occupying Academic Positions. Scientometric data of Assist. Prof. Milanova exceed significantly the requirements of the Institute for occupying the academic position "Associate Professor".

Major Scientific Contributions of Publications

The main scientific contributions in the publications of the habilitation work of Assist. Prof. Milanova refer to the glass formation in oxide systems containing the non-traditional network formers MoO_3 and WO_3 without the participation of classical glass formers. The regions of glass formation in multicomponent molybdate and tungstate systems have been identified: MoO_3-CuO-Bi_2O_3(PbO), MoO_3-La_2O_3-Nd_2O_3, ZnO-Bi_2O_3-WO_3, ZnO-Bi_2O_3-WO_3-MoO_3, ZnO-WO_3-Nd_2O_3-Al_2O_3, ZnO-WO_3-La_2O_3-Al_2O_3. Molybdate and tungstate glasses containing oxides of transition metals, oxides of heavy metals and oxides of rare earth elements have been synthesized. Using various spectroscopic techniques (infrared and Raman spectroscopy, diffuse-reflectance spectroscopy in the visible and near ultraviolet region, X-ray photoelectron and X-ray absorption spectroscopy), the basic structural units and the bonds between them for various compositions of the amorphous networks are determined. It was proved that a key factor for the formation of an amorphous network in non-traditional molybdate and tungstate glasses is the stabilization of corner connected Mo(W)O_6-octahedra and Mo-O-Me and W-O-Bi (Zn) bonds with the second component. In the case of molybdate glasses, the simultaneous presence of tetrahedral MO_4 groups is also needed for glass formation.

The publications beyond the habilitation work can be are divided into two topics: glass formation and synthesis of oxide materials. The main contributions here are as follows:

The glass formation in multicomponent tungstate systems has been studied, in which, in addition to the non-traditional network former WO_3, the classical glass former B_2O_3 and oxides of rare earth elements also participate. Bismuth-borate glasses containing both La_2O_3 and WO_3 were obtained. It was found that La_2O_3 forms La-O-W and La-O-B bonds thus ensuring better connectivity between the various structural units and favouring the WO_3 incorporation into the bismuth-borate network. The effect of Nb_2O_5 on the structure and physical properties of WO_3-La_2O_3-B_2O_3 glasses was studied. Monolithic transparent glasses were synthesized in the multicomponent WO_3-La_2O_3-B_2O_3-Nb_2O_5 system and structural models for their amorphous network for different Nb_2O_5 content were proposed. The main niobium structural units in the amorphous network are corner connected NbO_6-octahedra. It has been proved that boron-tungstate glasses containing Nb_2O_5 are suitable amorphous matrices for incorporation of the laser-active Eu^{3+} ion into them.

New methods of synthesis (from supercooled melt, controlled glass crystallization, "soft" mechanochemical synthesis) of crystalline vanadate and molybdate phases with catalytic, photocatalytic and electrical properties have been developed: $FeVO_4$, $LiVMoO_6$, α-$Bi_2Mo_3O_{12}$, β- $Bi_2Mo_2O_9$. Electrochemical studies have been performed which evidence that $LiVMoO_6$ obtained by "soft" mechanochemical synthesis is a promising candidate for a cathode in a solid-state lithium-ion battery.

All publications of Assist..Prof. Milanova in the competition are collective, but the role of the candidate in them is well outlined. Her scientific contributions are mainly fundamental and help to clarify the relationship "composition - structure - glass formation" for glasses of non-traditional network formers as new materials with potential application. .

CONCLUSIONS

Assistant Professor Dr. Margarita Milanova participates in the competition with an asset that fulfills the requirements for occupying the academic position of Associate Professor at the Institute of General and Inorganic Chemistry - BAS. She performs topical studies that are an essential part of the systematic research on non-traditional glasses and oxide materials of the Laboratory of High Temperature Oxide Materials at IGIC, for the needs of which the competition was announced. Her publications contain a large amount of experimental material, which is correctly analyzed. The scientific contributions are significant and have a good impact in the literature. Based on all the above, as well as my personal impressions, I evaluate the application positively and strongly recommend Assistant Professor Dr. Margarita Kirilova Milanova to be appointed at the academic position of "Associate Professor" in professional field 4.2. Chemical sciences (Inorganic chemistry) at the Institute of General and Inorganic Chemistry - BAS.

Member of the Scientific Jury:

Prof. Dr. Ekaterina Zhecheva

20.09.2021