

Peer Review

**From Prof. Dr. Rositsa Petrova Nikolova
Bulgarian Academy of Sciences
(Member of the Scientific Jury)**

on the competition for occupying the academic position Professor in the professional field 4.2. "Chemical sciences", scientific specialty "Inorganic Chemistry" for the needs of the Institute of General and Inorganic Chemistry – BAS, Laboratory „Intermetallics and intercalation materials”, announced in the State Newspaper 36, from 03.05.2019.

The only applicant for the announced competition is Assoc. Prof. Dr. Violeta Koleva, currently member of the research team of the Laboratory "Intermetallics and intercalation materials" at the Institute of General and Inorganic Chemistry (IGIC) - BAS.

Biographical data of the applicant

Assoc. Professor Violeta Koleva graduated from the Faculty of Chemistry at Sofia University "St. Kliment Ohridski" in 1984. After the graduation she joined the Faculty of Chemistry as a chemist and during the period 1996 - 1993 she was a PhD student at the Sofia University "St. Kliment Ohridski". In 1993, she defended her PhD thesis entitled "*Investigation of the dehydration processes and IR spectra of iodide hydrates of some divalent metals*". Since 1994 Dr. Violeta Koleva has worked at IGIC – BAS, where in 1995 she won a competition for Research Associate II degree and in 1997 a competition for Research Associate I degree. The academic title Associate Professor is acquired by Dr. Koleva in 2007. In 2010 she was appointed to an academic position Associate Professor at the IGIC-BAS (according to the Law for the Development of the Academic Staff in the Republic of Bulgaria (LDASRB) - since 2010 the academic degrees had to be transformed into academic positions).

Compliance with the requirements for occupying the academic position "Professor"

Dr. Koleva, meets the requirements for occupying the academic position "Professor", published in LDASRB (Chapter 3, Section IV) and in the Regulations for its implementation namely:

- Dr. Koleva has been registered in the National Center for Information and Documentation - NACID (<https://ras.nacid.bg/dissertation-preview/3335>), where her doctoral degree and academic rank (associate professor) are recognized.

- According to the data published in NACID Dr. Koleva gained the academic position Associate Professor at IGIC-BAS in 2008 (12.02.2008), but in the Document named *3-Udostoverenie_Staj v_IONH.pdf*, issued by IGIC-BAS the date of appointment is 01.07.2010. Despite the cited inconsistency, upon submission of the documents Dr. Koleva has occupied the academic position Associated Professor at IGIC-BAS for more than five years - the period required by the normative documents;
- The publications and citations submitted for the competition do not repeat the ones presented for the academic position "Associate Professor";
- There is no evidence of plagiarism in the scientific works, presented by Dr. Koleva for participation in the current competition;
- Dr. Koleva has submitted for participation in the competition detailed information about her scientific activities. The evaluation of the presented materials by a system specified in the Regulations applying the LDASRB, demonstrates that Dr. Koleva covers the requirements for the acquisition of the scientific degree "Doctor" and for the occupation of the academic positions "Assistant Professor", "Associate Professor" and "Professor" correspondingly. The table below provides information on the required and the calculated (for the applicant materials) values for the specified in the normative documents indicators. One can see that Dr. Violeta Koleva significantly exceeds the national requirements for the occupation of the academic position "Professor", the enhanced criteria of the Bulgarian Academy of Sciences and the special requirements of the Institute of General and Inorganic chemistry.

Indicators	Points		
	Minimum Required for professional field 4.2. Chemical science		Calculated for the applicant materials
	Regulation for implementation of the Low*	BAS/IGIC	
<i>A PhD thesis</i>	50	50	50
B <i>Habilitation work - scientific publications in journals referenced and indexed in Web of Science and Scopus.</i>	100	100	344

<i>Г Scientific publications in journals referenced and indexed in the Web of Science and Scopus, outside the habilitation</i>		200	220	490
<i>Д Citations in scientific publications, monographs, collections, and patents referenced and indexed in the Web of Science and Scopus</i>		100	120	1074
E	<i>Guidance of successfully defended PhD students</i>			75
	<i>Participation in national scientific or educational projects</i>			100
	<i>Guidance of national scientific or educational projects</i>			60
	<i>Funds received from projects leaded by the Candidate</i>			7.4
		150	150	242
Ж*	<i>Hirsh Index (H) (Scopus) * 10</i>		100	130
	<i>Participation in national scientific or educational projects</i>		20	20
			120	150
total		600	760	2350.4

* Law on the Development of the Academic Staff in the Republic of Bulgaria

Brief analysis of the presented materials

To participate in the competition Assoc. Prof. Koleva has presented 41 scientific works published during the period after the habilitation (2008-2019). Fifteen of them report on the development of a novel methods for preparation of lithium and sodium transition metal phosphates and physicochemical and morphological characterization of the obtained materials. The described studies constitute the habilitation thesis "Phosphate salts as electrode materials in environmentally friendly rechargeable batteries". presented by the applicant for the competition .

The other 26 publications include results on the comprehensive structural and spectroscopic studies of newly obtained oxide materials with interesting physical properties. All of the

presented publications are published in journals included in the scientific databases WoS and/or Scopus. Twenty-one of the publications are in journals of the highest (Q1) category. Thirty-five of the publications have less than 6 co-authors and Dr. Koleva is first author of sixteen of them. Seventeen of the submitted publications are co-authored with the members of the scientific team of the Laboratory "Intermetalides and intercalation materials" Prof. Stoyanova and Prof. Zhecheva. They have signed a declaration of recognition, specifying the contribution of Assoc. Prof. Koleva to these publications, namely, synthesis, infrared spectroscopy, X-ray diffraction and morphological analysis of new electrode materials.

According to the data in the attached documents the total number of citations of the publications with participation of Assoc. Prof. Koleva is 822, out of them 537 after 2008 (the period after the habilitation). The publications submitted for the current competition have 379 independent citations, 230 of which on the publications included in the habilitation work. According to the Scopus Database upon August 2019 Assoc. Prof. Koleva is a co-author of 72 scientific publications, which have been cited 839 times, excluding self-citations. The *h-index* (Scopus) of the applicant is **15** for all publications and **10** for the publications presented for this competition.

During the period, envisaged in the competition Assoc. Prof. Koleva took participation in 72 scientific conferences, presenting her research results in 62 posters and 10 oral presentations. Assoc. Prof. Koleva was an invited speaker in the 25th Congress of Chemists and Technologists of Macedonia, September 2018, where she has present a lecture entitled “Design of Phosphate Intercalation Compounds: Synthesis Approach, Structure and Morphology Control” .

After 2008 Assoc. Prof. Koleva has been a head of three scientific projects, funded under the bilateral cooperation between BAS and the Macedonian Academy of Sciences and Arts (MASA). She has been also a member of the scientific teams of 15 research projects, among them “Creation of a Center of Excellence in Mechatronics and Clean Technologies”, Center of competence HITMOBIL – “Technologies and Systems for Generation, Storage and Utilization of Clean Energy” funded by the OP Science and Education for Smart Grow. Assoc. Prof. Koleva is involved in the implementation of the National Research Program "Low Carbon Energy for Transport and Life" (E +). It could be said that the applicant is a member of the scientific teams

of the specific national projects and programs related to energy efficiency, energy conservation and the use of renewable energy.

Dr. Koleva actively participates in the training of young researchers. She is a co-supervisor of three successful PhD students. One of them being PhD student at IGIC -BAS and two PhD students from the University "St. Cyril and Methodius" Skopje, Macedonia.

Summary of the scientific achievements

The studies on new and modified anode materials are undoubtedly actual in the context of resolving global problems for effective utilization and storage of energy. Energy efficiency is part of the priority areas of the Innovation Strategy for Smart Specialization of the Republic of Bulgaria and, accordingly, part of the National Science and Research Priorities defined in the National Strategy of Scientific Research. The systematic study of electrode materials for lithium and sodium-ion batteries is one of the scientific subjects at the Laboratory "Intermetalides and intercalation materials" IONH-BAS. Based on the scientific achievements by the laboratory team and her previous experience Dr. Koleva has defined a new research area namely "Phosphate salts as electrode materials in environmentally friendly rechargeable batteries". The results of the first phase of this study are published and form the habilitation work for the current competition.

The main contributions of Assoc. Prof. Koleva are related to the development of new, more efficient methods for synthesis, the definition of the structural peculiarities and the analysis of the correlations between synthetic conditions - crystal structure – morphology and the electrochemical properties of the studied materials. The systematic and comprehensive investigations performed by Dr. Koleva and her colleagues from the Laboratory "Intermetalides and intercalation materials" allow them to obtain products with predefined characteristics and desirable properties. The specific contributions of the applicant's investigations could be summarized as follows:

1. A new and simple method for preparation of single-phase lithium phospho-olivines and their solid solutions has been developed. The method is based on application of phosphate-formate precursors and provides an opportunity to affect both the particle dimensions and

morphology of the end product. The method allows using of different organic precursors to control the amount of carbon content and thus the electrochemical properties.

2. A new method for preparation of transition metal lithium and sodium phospho-olivines, by using of structure/morphology directing precursors has been developed. The "soft" synthetic conditions of the method suggest preparation of nano-sized materials.

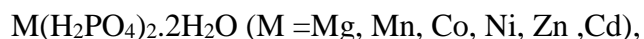
3. The ability of the newly developed methods to control the structural and morphological characteristics of the end product has been defined on the basis of systematic structural and spectroscopic analyses of the precursors and the end products, obtained at different synthetic conditions.

4. New phases with olivine and dittmarite type crystal structures have been synthesized and their crystal structures were determined. The refinement of the atomic sites occupancy allows correct analysis of the electrochemical activity of the new materials.

5. A critical analysis of structural and spectroscopic data for a number of new and modified lithium and sodium phosphates was performed. This allows a complex evaluation of the synthesis-structure-property relationship. Due to their volume and systematic nature, the obtained results are of considerable importance for the studies regarding the advanced materials.

The other 26 publications, presented for the current competition, can be organized into three thematic areas with the following scientific contributions correspondingly:

1. Relations between the structural and vibrational spectroscopic characteristics for a number of hydrate salts were defined. The studied three groups of compounds contain strong hydrogen bonds in their crystal structures suggesting interesting physical properties:



The synthesis methods for obtaining of the large number of studied compounds in a pure form were described. Data from the IR and Raman spectroscopy analyses of the studied compounds and their deuterated forms at different temperatures were systematized.

2. Complete structural, thermal and morphological characteristics of thin films based on manganese and vanadium oxides were performed. As a part of two successfully defended PhD theses, these studies are also contribution to the training process of young scientists.

3. Conditions for the precipitation of nickel hydroxides with three different crystalline structures were defined. The studied materials are potential candidates for supercapacitors.

In conclusion, I can confirm that, the documents submitted by Assoc. Prof. Violeta Koleva show that she corresponds to all the requirements of the normative documents for taking up the academic position “Professor” at the Institute of General and Inorganic Chemistry, BAS. The research interests of the applicant are an important part of the scientific activities of the Laboratory “Intermetalides and intercalation materials”, for whose needs the competition was announced. The participation of the candidate in different research teams carrying out projects of national and international importance, as well as her responsibility on the young scientist’s education and training, implies that she will continue to perform research in the field of synthesis and characterization of new perspective materials. I, therefore, convincingly propose to the honorable members of the Scientific Jury to recommend Assoc, Prof. Dr. Violeta Koleva to be given the academic position Professor in the professional field 4.2. "Chemical sciences", scientific specialty "Inorganic Chemistry" at the Laboratory „Intermetallics and intercalation materials” of Institute of General and Inorganic Chemistry – BAS,

29. 08. 2019 г.

Reviewer:

Prof. Rositsa Nikolova