

Report

on the materials presented for participation in the competition for the academic post of "Professor" for the needs of *Biomacromolecules and Biomolecular Interactions* Department at the Institute of Biophysics and Biomedical Engineering - Bulgarian Academy of Sciences (IBPhBME-BAS) in *Natural sciences, mathematics and informatics*, professional field 4.3. *Biological Sciences* (scientific specialty "Biophysics")

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The only candidate in the competition for "Professor" announced in the *State Gazette*, issue 41/21, May 2019 and on the website of IBPhBME - BAS (<http://biomed.bas.bg/bg/procedures/concourses-prof-sen-assist-prof-bbi/>), is **Associate Professor Dr. Sashka Boychova Krumova** from the same institute.

1. General presentation of the procedure and of the applicant

The materials presented by Assoc. Prof. Dr. S. Krumova are in accordance with the Regulations for the Development of the Academic Staff of IBPhBME - BAS and meet the requirements of the Institute for the academic post "Professor".

In the competition the candidate has presented 21 scientific publications (excluding those used in the PhD thesis and for the academic post "Associate Professor"), which are related to the subject of the competition and are accepted for review. Of these, 19 are published in journals with an impact factor (IF) categorized as follows: 10 - in Q1, 7 - in Q2 and 2 – in Q3 (the higher quartile is taken with Web of Science and Scopus reported simultaneously). Indicator B lists 8 articles (3 of them in Q1 and 3 – in Q2), and indicator D lists 13 articles (7 in Q1, 4 in Q2, 2 in Q3). The data on the fulfillment of the minimum requirements also includes information about: a published book based on the PhD thesis of the applicant; 137 citations; 19 national and international scientific projects (participation in 4 international and 13 national projects, as well as leadership of 2 national projects); funds of projects managed by the applicant are also presented. As a PhD supervisor, Assoc. Prof. Krumova has one successfully defended PhD student. In terms of indicators V, G, D, and E, the applicant exceeds the required number of points set by IBPhBME – BAS. In addition Dr. Krumova exceeds the minimum number of 15 publications in IF journals, in accordance with the specific requirements of the Institute for the academic post of "Professor".

Dr. Krumova's biographical record shows that her higher education and her subsequent academic development are in the professional field of the competition. Her most important research results have been obtained at IBFBMI-BAS. These facts show the connection of the applicant's research with the scientific topics of the Institute and suggest future benefits from her habilitation for the research staff of the Institute and in particular of her Department "Biomacromolecules and biomolecular interactions".

2. General characteristics of the applicant's activities

Contributions. Assoc. Prof. Dr. Krumov's main contributions relate to experimental studies of biological objects (soluble and membrane-bound proteins and their complexes in plants, microorganisms, and in humans) by analytical methods (mainly differential scanning calorimetry (DSC), as well as fluorescence spectroscopy, atomic force microscopy, isothermal titration

calorimetry, and other analytical methods). Depending on the subject of study, contributions can be divided into the following main groups:

1. *Investigation of the photosynthetic apparatus of plants and micro-organisms*: structural changes of light-harvesting complexes of plant photosystems associated with their regulatory functions were determined; the structural stability of cyanobacterial light-harvesting complexes has been characterized and a calorimetric approach applicable to the native cellular environment has been developed; the effects of exogenous plant growth regulators on the structural organization of photosynthetic membranes have been elucidated. Based on these contributions, 8 articles were published.

2. *Calorimetric characterization of major components of human normal and pathological cells*: a correlation between important structural and functional proteins has been established to track changes in erythrocyte morphology occurring during aging; blood serum has been characterized and specific calorimetric markers for multiple myeloma (MM) have been identified, and the changes in the profile of thermograms have been correlated with the clinical status and treatment of patients with such a disease; the higher ability of the DSC-based approach to detect the malignant state compared to the fluorescence one was directly demonstrated in MM diagnosed patients; differences in the calorimetric signatures of cancer and normal cells were found for a large group of cell lines; a difference has been recorded in the stabilization of plasma proteins in paranoid schizophrenia patients on routine antipsychotic treatment in comparison to healthy controls. These results open new perspectives on the use of DSCs in medical practice for the diagnosis and monitoring of processes in the human body related to aging, diseases and their therapeutic treatment. Twelve articles were published on these contributions.

3. *Estimation of the thermal stability and binding energetics of bacterial thymidylate synthetase ThyX*: a difference in binding of the cofactor and substrate to the synthetase in microorganisms and viruses has been found and key interactions with amino acids have been identified. There is one article on the contribution.

The applicant's contributions can be classified mainly as scientific and such focused on revelation and elucidation of mechanisms and processes in the living organisms, related to structural-functional dependencies and stability of proteins and protein complexes. In the Extended Habilitation Report on the scientific contributions described by Assoc. Prof. Krumova, the possibilities for their application have also been outlined, and in a number of cases their practical implication has been outlined. The research in this direction is currently ongoing.

Scientific metrics. Dr. Krumova has published her research results mostly in renowned scientific journals with high impact factor (IF), such as *Analytical Chemistry* (IF=5,636), *Langmuir* (IF=3,993), *Biochimica et Biophysica Acta - General Subjects* (IF=3,679), *Biophysical Journal* (IF=3,632), *Photosynthesis research* (IF=3,091) etc. The total IF of her publications is 51.4. In fact, 90% of the competition publications are in IF journals, more than half of them are in Q1 category, which is an indicator of their quality. This is confirmed by the data of the candidate in the scientific information system Web of Science (WoS) – the search shows that Assoc. Prof. Krumova has 41 publications, cited over 270 times with h index 13. It is worth noting the high publishing activity of the candidate in the period after holding the academic post of Associate Professor, and especially in recent years - more than half of the scientific papers on the competition were published in the period 2016 – 2019. According to WoS data for this period Dr. Krumova has 25 publications, cited 190 times. The citation list submitted for the competition includes 25 publications, published in the period 2003 - 2018, which have been cited 137 times, half of these publications are included in the list of publications for the competition.

This analysis illustrates a persistently high level of publication activity of Assoc. Prof. Krumova in recent years. Her scientific metrics testify to the international recognition of her results by the international scientific community.

Assessment of the personal contribution. I evaluate the personal contribution of the candidate on the basis of her position in the list of authors, the results reported in the publications in accordance with her competence and the contributions described in the Extended Habilitation Report. In 5 of the publications she is the 1st author and in 4 publications she is the corresponding author, which demonstrates the leading role of the candidate in the studies presented in these articles. Of these, 5 articles pertain to the group of contributions related to the calorimetric characterization of major components of human normal and pathological cells. It is noteworthy that among them is the most cited article from the list - the one related to the calorimetric monitoring of the serum proteome of patients with schizophrenia, in which Assoc. Prof. Krumova is the first author (14 citations). Associate Professor Krumova is a corresponding author in 2 (out of 8) of the most recently published articles (numbers 19 and 20 in the list) related to the photosynthetic apparatus of plants and microorganisms. This fact shows that Assoc. Prof. Krumova has recently taken a leading position among her co-authors in this scientific field. In the contribution related to the investigation of the bacterial thymidylate synthetase ThyX interactions, the candidate is the first author. Although there is only one publication on this contribution, I believe that such studies have great potential for the development of research at IBFBMI, and I recommend that the applicant continue her work on the study of protein-ligand complexes using isothermal titration calorimetry. In addition, I would like to mention that in the Extended Habilitation Report, the candidate reports on a wide network of scientific collaborations, which is a guarantee for her and the Institute's future interdisciplinary and wide-ranging research within joint national and international projects.

3. Critical comment

I have a note on the Extended Habilitation Report: publication No. 15 from the list (Krumova et al., *Int. J. Biol. Macromol.*, 2016) has been omitted in the bibliography of the Extended Habilitation Report; publication Krumova et al. (*J. Photochem. Photobiology*, 2013) is marked with a "*" in the bibliography of the Extended Habilitation Report, but is not included in the list of publications for the competition, as it was used in the competition for "associate professor". These errors are typographical and they do not change the number of publications used for the competition and the content of the Extended Habilitation Report.

CONCLUSION

The documents and materials presented by Assoc. Prof. Dr. Sashka Krumova meet the requirements of the Act for the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for the Implementation of ADASRB, the Regulations for the Implementation of ADASRB of BAS and the specific Regulations of IBPhBME-BAS.

The candidate has submitted a sufficient number of scientific papers published after the defense of his PhD thesis and the completion of the competition for the academic post "Associate Professor". According to the main indicators she collects points significantly above the minimum required by the IBPhBME criteria. In this way, the research results achieved by Dr. Krumova fully comply with the specific requirements of the IBPhBME-BAS Regulations for the implementation of ADASRB.

Assoc. Prof. Dr. Krumova has original scientific and applied contributions, most of which have been published in renowned scientific journals with a high impact factor gaining in this way

international recognition. In a number of publications, she has a leading position and an outlined personal contribution to the results presented, which marks her as a distinguished scholar with own academic profile.

The above gives me a reason to assess positively the candidature of Dr. Krumova and to recommend to the Scientific Jury to prepare a report-proposal to the Scientific Council of IBPhBME-BAS for the election of **Associate Professor Dr. Sashka Boychova Krumova as a Professor** in the professional field 4.3. *Biological Sciences* (scientific specialty “*Biophysics*”).

15.09. 2019 г.

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Prof. Ilza Pajeva