

REPORT

from: Prof. Eng. Vilma Petkova Stoyanova PhD, Institute of Mineralogy and Crystallography "Acad. Iv. Kostov" (IMC) – BAS

on the materials presented for participation in the competition for the academic position **“Professor”** in the Institute of Biophysics and Biomedical Engineering at the Bulgarian Academy of Sciences (IBPhBME-BAS), professional field 4.3. Biological sciences, scientific specialty “Biophysics” for the needs of the section “Biomacromolecules and Biomolecular Interactions” to IBPhBME-BAS

With Order № 13 / 06.01.2022 issued by the Director of The Institute of Biophysics and Biomedical Engineering at the Bulgarian Academy of Sciences (IBPhBME-BAS), I have been appointed a member of the scientific jury of a competition for the academic position “Professor” in the professional field 4.3. Biological sciences, scientific specialty “Biophysics” for the needs of the section “Biomacromolecules and Biomolecular Interactions” to IBPhBME-BAS. For participation in the announced competition was submitted documents only Assoc. Prof. Svetla Todinova from IBPhBME-BAS.

1. General presentation

Assoc. Prof. Svetla Todinova graduated from the Technical University of Sofia in 1982 with a degree in MSc in Electronics. Her qualification is “electronics engineer”. In 2013 she defended her PhD degree on the topic: “Thermodynamic profile of the plasma proteome in malignant diseases” and obtained the educational and scientific degree “PhD”. In 1998 she was elected research associate / chief assistant, and in 2018 after a competition she was elected associate professor at IBPhBME-BAS. She has a total of 33 years of work experience, of which 5 years he holds the academic position of “Associate Professor” at IBPhBME-BAS in the professional field: 4.3. Biological sciences.

2. Applicant's research activity.

Presented to me by Assoc. Prof. St. Todorova set of materials on electronic media is in accordance with the Regulations for the development of the academic staff of IBPhBME-BAS and includes all necessary documents.

In compliance with the requirements of the competition for the academic position of “professor” in Institute of Biophysics and Biomedical Engineering at the Bulgarian Academy of Sciences (IBPhBME-BAS) A total of 57 scientific papers were submitted (57 publications, 54 of them with IF), and Assoc. Prof. Todinova participated in the competition with 26 scientific papers that are outside the dissertation and were published after holding the academic position of “Associate Professor”. The distribution in quartiles is as follows: Q1 - 7, Q2 - 12, Q3 - 6. and 1 journal article that is not in the metrics of the Journal of Science Citation Reports (JCR) and the Scopus Scimago Journal Rank (SJR). The candidate is a corresponding author in 6 of the publications (4.3, 4.4, 4.5, 4.8, 7.12, 7.13) and first in 7 (4.1, 4.2, 4.6, 4.7, 4.8, 7.10, 7.12); second author is in 8 publications (4.9, 7.1, 7.3, 7.6, 7.14, 7.15, 7.16, 7.17), third and next - in 11. Assoc. Prof. Todinova does not present a publication in which he is an independent author.

The habilitation paper (criterion B) combines 9 articles out of the 25 referred with a contribution of 170 points, and the publications under criterion D - 335 points.

In connection with the presented scientometric indicators, I find that in the materials of Assoc. Prof. Todinova, she has placed 20 points in publications in the Journal of Thermal Analysis and Calorimetry. According to the Journal Citation Reports (<https://jcr.clarivate.com/jcr/browse-journals>), the Journal of Thermal Analysis and Calorimetry in the field of "Chemistry, analytical" is classified in category Q1 for 2020.

According to the submitted documents, the total number of observed citations of publications with the participation of Assoc. Prof. Todinova is 171 with a contribution of 342 points. The citations in scientific journals, referenced and indexed in world-famous databases of scientific information (Scopus and Web of Science) are 167. The Hirsch index (h) of the candidate, according to the Web of Science database, is 10, and according to Scopus is 12.

A table with 27 participations in national and international conferences, seminars, symposiums is presented in the Report "Presentations" for participation in conferences and other scientific events (after obtaining the educational and scientific degree "PhD" and competition for the academic position "Associate Professor") and scientific schools with 45 presentations. The oral reports presented in this table are 8.

From the reference presented in the materials for fulfilment of the criteria under art. 6 of the Regulations on the terms and conditions for obtaining scientific degrees and for holding academic positions in IBPhBME-BAS, it is seen that for each of the indicators (A-50 points; B-170 points; C-335 points; D-343 points; E-239 points) Assoc. Prof. Todinova has the required number of points - 1136, and according to all indicators this number significantly exceeds the minimum national requirements and the higher criteria in BAS for holding the academic position "Professor" in the professional field 4.3. Biological sciences.

The scientific activity of Assoc. Prof. Todinova, presented through her publications, includes research on solving current problems of biomedicine. Her research involves identifying biomarkers in complex systems, such as body fluids or cells, that can serve as a diagnostic tool, monitor the effectiveness of a treatment, and help develop new therapies. To achieve such serious scientific goals, modern analytical techniques and methods have been used, with an emphasis on differential scanning calorimetry (DSC). As one of the methods of thermal analysis, the DSC method is widely used in the research of inorganic materials science. Despite the applicability of these methods in various fields, directions and objects of research, in biochemistry and medicine in the use of thermal methods and in particular DSC, certain limits are set. This is due to the strong sensitivity of biological and biomedical sites to the effects of temperature. Assoc. Prof. Todinova and her colleagues have identified opportunities for the use of the DSC method for the needs of biomedicine. The following were studied:

1) Temperature and conformational stability of native proteins in biological samples and model systems by applying the calorimetric approach in biomedicine with objects of study - blood plasma / serum, erythrocytes; hemocyanin, albumin, insulin.

2) Thermal stability and properties of native and chemically modified therapeutic proteins. Effect of ionic liquids on their stability and activity. Objects of research - hemocyanin, insulin, albumin;

3) Calorimetric characteristics of cancer cells treated with conventional and plant secondary metabolites - Subjects - normal (MCF-10A) and tumour cell lines (MCF-7, MDA-

MB-231), Therapeutics - miltefosine, cisplatin, herbal anticancer Therapeutics - *Cotinus coggygria* Scop.

4) Morphometric and nanomechanical characteristics of shaped elements in norm and pathology. Objects of research - platelets, erythrocytes;

5) Structural stability and macro organization of the pigment-protein complexes, building the photosynthetic apparatus of higher plants and cyanobacteria Objects of research - light-collecting complexes, intact and fragmented thylakoid membranes.

The results of the research are summarized in a reference to the scientific contributions in the publications presented in the Habilitation Thesis (indicator B). It includes 9 publications (4.1-4.9). The scientific contributions in the publications of the Habilitation Work are related to:

- establishment of specific DSC profiles of blood serum from patients diagnosed with different types (secretory and non-secretory forms) of multiple myeloma (MM) and Waldenström's macroglobulinemia. Differential scanning calorimetry is used as a suitable tool to characterize the thermodynamic properties of basic serum/plasma proteins and to establish calorimetric markers for various diseases. Research provides an opportunity to prove that the method can distinguish these diseases and provide information about the effect of treatment.

- the formation of precancerous lesions in female and male animal models leads to significant changes in calorimetric parameters, and therefore these parameters can be considered as indicators of malignant transformation

- study of the potential of the calorimetric approach for analysis of the influence of various diseases on the thermodynamic behaviour of red blood cells (RBC).

- conducting basic research using DSC and spectroscopic methods on the process of thermal denaturation of hemocyanins (oxygen-carrying protein in invertebrates) and its isoforms isolated from the hemolymph of *Helix lucorum* (HH) and *Helix aspersa maxima*.

The results of the research outside the Habilitation Work are summarized in the reference for the scientific contributions in the publications on indicator D. It includes 17 publications (7.1-7.17). The scientific contributions in these publications are related to:

- Characterization are temperature and conformational changes resulting from the reorganization of the protein molecule of hemocyanin conjugated with ferulic, rosemary (RA) and folic (FA) acids.. An association between the change in temperature stability of hemocyanin conjugates and the observed changes in the secondary structure has been established.

- It was evaluated the effect of biocompatible ionic liquids on the structure, stability and antitumor properties of hemocyanins isolated from haemolymph of *Rapana thomasiana* (RtH) and *Helix pomatia*.

- It has been studied the potential of the differential scanning calorimetry method for selection of the most effective drugs on tumor cell lines.

- Based on DSC analysis of several mutants of *Synechocystis* sp. PC 6883 are identified the main temperature transitions of photosynthetic complexes and their components in cyanobacteria.

The achieved results in the research activity of Assoc. Prof. Todinova are remarkable in terms of science metric indicators, areas and objects of research with significant fundamental and scientific-applied contributions in biomedicine. I would like to emphasize her personal contribution

in the field of differential scanning calorimetry in the development and application of DSC method in the area of biomedical investigations.

3. Educational and pedagogical activity

Assoc. Prof. Todinova also develops educational and pedagogical activities under the guidance of a successfully defended doctoral student.

4. The project activity

Assoc. Prof. Todinova participates as a member of the research teams of a large number of national research projects funded by Bulgarian financial institutions and international bilateral projects developed after holding the academic position of "Associate Professor". She also led the Bulgarian team in a research project at the NSF.

5. Personal impressions

I know personally Assoc. Prof. Dr. Svetla Todinova, I appreciate her competence in the field of thermal calorimetric research. She is a scientist capable of creating, organizing and leading successful research and as a professor can contribute to the further development and establishment of IBPhBME-BAS as a leading research center.

6. Conclusion

The documents and materials presented by Assoc. Prof. Todinova **meet all the requirements** of the Law on the Development of Academic Staff in the Republic of Bulgaria (LASRB), the Regulations for the implementation of the LASRB and the relevant Rules of IBPhBME-BAS.

A sufficient number of scientific papers have been presented, published after the materials used in the defence of the educational scientific degree "PhD" and after the academic position of "Associate Professor". The results achieved by Assoc. Prof. Todinova in the research activity **fully comply** with the specific requirements of IBPhBME-BAS, adopted in connection with the Regulations for the implementation of the Law on Research and Development.

I give a **positive assessment and recommend** Assoc. Prof. Svetla Todinova PhD to be elected to the academic position of "Professor" at The Institute of Biophysics and Biomedical Engineering at the Bulgarian Academy of Sciences (IBPhBME-BAS) in professional field 4.3 Biological sciences, scientific specialty "Biophysics".

6.04.2022 г.
Sofia

Prepared the report:
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