REVIEW

by Dr. Emilia Mitkova Mihailova
Scientific specialty: Electrical, magnetic and optical properties of condensed matter
Professor of Physics at the Agricultural University Plovdiv

of the materials submitted for participation in the competition
to occupy the academic position "professor"
at Paisii Hilendarski University of Plovdiv

in the field of higher education: Natural sciences, Mathematics and Informatics
professional field: Physical Sciences (Condensed Matter Physics)

Assoc. Prof. Dr. Maria Georgieva Marudova-Zhivanovich from the department "Physics" at the "Faculty of Physics and Technology" of Plovdiv University "Paisii Hillendarski" is a candidate for the "professor" position, announced in the State Newspaper, No. 92 of 18.11.2022 and on the website of the University of Plovdiv "Paisii Hilendarski" for the needs of the "Physics" department at the "Faculty of Physics and Technology".

1. General presentation of the received materials

Subject:
By order No. RD-21-330 dated 15.02.2023 of the Rector of Plovdiv University "Paisii Hilendarski" (PU) I have been appointed as a member of the scientific jury of a competition for the academic position of "professor" in the PU in the field of higher education Natural Sciences, Mathematics and Informatics, professional field Physical Sciences (Condensed Matter Physics), announced for the needs of the "Physics" department at the "Faculty of Physics and Technology".

For participation in the announced competition, documents were submitted by a single candidate: Assoc. Prof. Dr. Maria Georgieva Marudova-Zhivanovich from the Department of Physics at the Faculty of Physics and Technology of Paisii Hilendarski University of Plovdiv. The set of paper materials presented by Associate Professor Dr. Maria Georgieva Marudova-Zhivanovich is in accordance with the Regulations for the Development of the Academic Staff of the PU, and includes the following documents:

1. Application form to the rector for admission to participate in the competition;
2. Resume in European format;
3. Diploma of higher education with acquired educational and qualification degree "master" - original with attachment or notarized copy;
4. Diploma for educational and scientific degree "doctor" - original or notarized copy;
5. Diploma (certificate) for the academic position "docent" - original or notarized copy;
6. List of scientific works;
7. Scientific works (copies of publications);
8. Certificate of compliance with the minimum national and additional faculty requirements (if any);
9. Declaration of originality and authenticity of the attached documents;
10. Annotations of the materials under Art. 76. from PRASPU (in Bulgarian and a foreign language);
11. Extended habilitation certificate;
12. Self-assessment of contributions;
13. List of citations;
14. Document (certificate) for work experience;
15. Documents for academic work;
16. Documents for scientific research activity;
17. Other documents.

The candidate Assoc. Prof. Dr. Maria Georgieva Marudova-Zhivanovich has submitted a total of 40 scientific works, 1 book chapter, 1 active patent for an invention, 1 textbook, 1 manual for laboratory exercises in physics, and 7 electronic courses (two of which are in English). 40 scientific papers, which are outside the dissertation and are counted in the final evaluation, 1 textbook, 1 teaching aid, 7 electronic courses and 17 research projects are accepted for review. Documents for participation in the development of an invention for which an active patent has been obtained are also presented. The candidate Assoc. Prof. Dr. Maria Georgieva Marudova-Zhivanovich has participated in 17 research projects, two of which are international and 8 of which are national. She was the Principal Investigator of 3 of the national research projects.

2. Brief biographical data of the applicant:

• From 2009 to now – Associate Professor, Paisii Hilendarski University of Plovdiv;
• From 2007 to 2009 - Chief Assistant, Department of "Experimental Physics" at the Faculty of Physics, Paisii Hilendarski University of Plovdiv;
• From 2002 to 2007 - Senior Assistant, Department of "Experimental Physics" at the Faculty of Physics, Paisii Hilendarski University of Plovdiv;

• From 1999 to 2002 - Assistant, Department of "Experimental Physics" at the Faculty of Physics, "Paisii Hilendarski" University of Plovdiv;
Assoc. Prof. Dr. Maria Georgieva Marudova-Zhivanovich has extensive scientific and professional experience in connection with the announced competition. She specialized in Hungary in express microbiological methods and several times in England in the field of food science. Her teaching experience is impressive: 8 curricula and 19 study programs have been developed. Assoc. Dr. Maria Georgieva Marudova-Zhivanovic has so far published over 60 articles in journals with an impact factor and/or impact rank.

3. General characteristics of the applicant's activity

Assessment of the candidate's educational and pedagogical activities:

As of February 1, 2023, Associate Professor Dr. Maria Georgieva Marudova-Zhivanovich has more than 24 years of teaching experience, with more than 13 years of experience as an associate professor at Plovdiv University (PU).
The academic competence of the candidate by professional direction 4.1. Physical Sciences, specialty in Physics is undoubted.

Assoc. Dr. Maria Georgieva Marudova-Zhivanovich:

• taught students in PU from the majors:

– Automotive technology
– Renewable energy
– Eco-energy technologies
– Electrical engineering
– Information and computer engineering
– Engineering physics
– Information physics and communications
– Computer and communication systems
– Mechanical engineering and technologies
– Medical physics
– Technologies in telecommunications
– Telecommunications and information systems
– Telecommunications with management
– Teacher of man and nature
– Condensed matter physics
– Hardware and software systems
– Food physics

• developed lecture courses for 12 academic disciplines at the PU;
• developed 1 textbook, 1 manual for laboratory exercises in physics, and 7 electronic courses (two of which are in English);
• supervised 4 doctoral students, one of whom defended successfully and one was dismissed with the right to defend;
• supervised 13 graduates who successfully defended the Bachelor's degree;
• she supervised 3 graduates who successfully defended the Master's degree.

Evaluation of the candidate's scientific and scientific-applied activity

Scientific experience:

As of February 1, 2023, Associate Professor Dr. Maria Georgieva Marudova-Zhivanovich has more than 24 years of scientific experience. During this time, she actively participated in international and national research projects as follows:

• Assoc. Dr. Maria Georgieva Marudova-Zhivanovich is a participant in 2 international research projects:
– 2021-1RO01-KA220-HED-000030286, "Applying some advanced technologies in teaching and research, in relation to air pollution", financed under the "Erasmus+" program - participant in the collective;
– BioSUPPORT Project no.: 245588, Project title: Strengthening the University of Plovdiv Research, Potential in Plant Systems Biology and Food Biotechnol-ogy, 2009-2012 – participant in the team;

• Assoc. Dr. Maria Georgieva Marudova-Zhivanovich participated in 8 national scientific-research projects, holding a leadership position in 3 of them:
– BG05M2OP001-2.016-0018, "MODERN-A: MODERNIZATION in partnership through digitization of the Academic Ecosystem", Operational Program NOIR, 2021-2023 - participant in the collective;
– KP-06-H38/3 – 12.2019, "New nanostructured polyelectrolyte medicinal systems for buccal administration", 2019-2022 – project manager.
- КП-06-Н37/29 - 12.2019, "Innovative packaging extending the shelf life of fruits and vegetables with multi-component edible coatings (ECOATFRUIT)", 2019-2022 - team leader
- KP-06-39/8 - 12.2019, "Chemoenzymatic catalysis in a non-aqueous environment", 2019-2022 - participant in the collective.
- DFNI-B-02/7, Preparation and characterization of polyelectrolyte multilayer structures from biopolymers for immobilization and prolonged release of medicinal substances with application on buccal mucosa - project manager

– BG161PO003-1.2.04-0012-C0001 «Increasing the capacity of Plovdiv University for applied research by equipping laboratories for biocompatible materials and molecular biosensors» - participant in the team.
– BG051PO001-4.3.04-0064, 2013-2014, Plovdiv Electronic University (PeU): national benchmark for conducting quality e-learning in the higher education system, MOMN – participant in the team.

The candidate in the competition has submitted a sufficient number of scientific articles published after the materials used in the competition for the academic position "Docent". In addition, one chapter of a book has been published, as well as one active patent for an invention has been acquired The scientific qualification of Assoc. Dr. Maria Georgieva Marudova-Zhivanovich is undoubted.

For participation in the competition, 40 scientific articles are submitted in publications that are referenced and indexed in world-famous databases with scientific information (Web of Science and Scopus). Of these articles, seven are in journals with SJR indicator Q1, four are in journals with SJR indicator Q2, four are in journals with SJR indicator Q3, twelve are in journals with SJR indicator Q4. Thirteen articles have been published in proceedings of international academic conferences. All publications are in English. All publications are co-authored, with most publications having four or more co-authors.

Contributions (scientific, scientific-applied, applied) and citations

In the works presented by Assoc. Dr. Maria Georgieva Marudova-Zhivanovich, the basic scientific research with significant personal contributions (the candidate is the first author of the scientific publications) is aimed at developing multi-layered nano-sized structures from natural polymers and establishing their potential for application as drug-delivery systems. Polyelectrolyte nanostructures are extremely suitable for the immobilization of materials with biological activity and are very good candidates for biomedical applications.
Research on the development of multilayer structures of polysaccharides and proteins with good mucoadhesive properties is reported in the scientific papers presented. Original scientific and scientific-applied contributions are the following:
• Chitosan/xanthan polyelectrolyte multilayer structures were successfully created for the first time on corona-charged polylactic acid and poly-ε-caprolactone supports (new technology).
• Chitosan/casein polyelectrolyte multilayer structures were successfully created for the first time on corona-charged polylactic acid and poly-ε-caprolactone supports (new technology).
• The influence of the deposition method on the thickness and structure of the layers has been established. The layers deposited by centrifugal spreading are characterized by a monolayer thickness of (10 ± 1.0) nm and a smooth surface, and by immersion deposition the monolayer

thickness is (20 ± 1.0) nm and interpenetration of the two polyelectrolytes is reported (new method).
• The influence of the pH and the ionic strength of the solutions of the used polyelectrolytes on the structure of the layers was determined. For the chitosan/casein system, optimal pH and ionic strength values were derived for maximum benzydamine hydrochloride loading efficiency (new method).
• The effect of pH and ionic strength on the release kinetics of benzydamine hydrochloride and curcumin from chitosan/casein multilayer structures was established. It has been proven that the release rate of the included active substance can be adjusted by changing the technological parameters (new technology).
• It was established that chemical modification of the polylactic acid support with EDAC leads to an increase in the amount of benzydamine hydrochloride included and slows down its release (new method).
• A multicomponent film of chitosan and polylactic acid was developed, in which salicylic acid was successfully incorporated (new technology).
• Using the method of differential scanning calorimetry, the process of retrogradation of starch in sponge cakes with added emulsifiers was investigated. It has been confirmed that emulsifiers slow down the process of starch retrogradation and thus extend the shelf life of marshmallows (confirmatory data obtained).

The candidate has also made significant contributions to the development of edible packaging based on biopolymers, the main of which are:

• A methodology was developed for obtaining a multicomponent film from hydroxypropyl methylcellulose and grape seed oil. The film has proven barrier properties against water vapor, O2 and CO2 and high antioxidant activity, which makes it suitable for application as active food packaging (new method).
• A methodology was developed for obtaining a multi-component edible film from potato starch and clove oil (new method);

The study of physical and physico-chemical properties of food products is mainly of an applied nature. The main contributions of the candidate in this direction are:

• The thermal properties of mixtures of sucrose and some of the most commonly used sweeteners in the confectionery industry - erythritol, sorbitol, maltitol and isomalt - were investigated. Based on their glass transition behavior, miscibility was found between sucrose/erythritol, sucrose/sorbitol, maltitol/erythritol, maltitol/sorbitol, maltitol/isomalt, erythritol/sorbitol, erythritol/isomalt and sorbitol/isomalt, most likely due to the formation of intermolecular hydrogen bonds (new hypothesis).

• Using the method of differential scanning calorimetry, the process of retrogradation of starch in sponge cakes with added emulsifiers was investigated. It has been confirmed that emulsifiers slow down the process of starch retrogradation and thus extend the shelf life of marshmallows (new technology).

Another direction in the candidate's scientific activity is the development of sensors for ammonia registration:

• An electric sensor for the registration of ammonia based on a composite film of polyaniline and polylactic acid was developed. The sensor is reversible and the response time is approximately 100 s. The ammonia concentration measurement range is from 10 ppm to 1000 ppm (new technology).
• An optical sensor for ammonia registration was developed based on a composite film of metal-organic structure (trimesic acid – Co (II)) and polylactic acid. The sensor is reversible and the detection threshold is 60 ppm. The response time of the sensor is between 2 min and 12 min depending on the concentration of ammonia (new technology).

The scientific and scientific-applied contributions listed above have received international recognition of importance, which is evident from the number of citations in the renowned refereed database Scopus - more than 150 citations in the last 5 years (without self-citations). In the Reference for the fulfillment of the minimum national requirements, the applicant has described 90 citations, all of which are in international journals. The quantitative indicators of the criteria for occupying the academic position "professor" have been met.

Implementation activity

The applicant has one active co-authored patent: Invention Patent Reg. No. 67404 B1, Title: OBTAINING WATER-INSOLUBLE GLUCAN THROUGH TRANSFER ENZYME REACTION, Inventor/s: Iliya Nikolov Iliev, Tonka Atanasova Vasileva. Veselin Petrov Bivolarski, Temenuzka Atanasova Yovcheva, Maria Georgieva Marudova-Zhivanovich, Asya Petrova Viraneva, Ivan Pa-nayotov Bodurov.

4. Assessment of the candidate's personal contribution

The personal contribution of the candidate is undoubted and most significant in the scientific publications of which he is the first author (B4.2; B4.7; D7.11; D7.19; D7.21; 7.24), as well as in the chapter of book (G8.1).

5. Critical remarks and recommendations

My recommendation to Assoc. Dr. Maria Georgieva Marudova-Zhivanovic is to continue her research work on the development of multi-layer nano-dimensional structures of natural

polymers for biomedical applications, as well as her research in the field of food physics, making efforts to independently publish some important scientific and/or scientific-applied results.

CONCLUSION

The documents and materials presented by Assoc. Prof. Dr. Maria Georgieva Marudo-va-Zhivanovich meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the Implementation of ZRASRB and the corresponding Regulations of PU "Paisii" Hilendarski".

The candidate Assoc. Prof. Dr. Maria Georgieva Marudova-Zhivanovich fulfills all the minimum national and additional requirements for the scientific and teaching activity of the candidates for acquiring a scientific degree and for occupying the academic position "professor" in scientific field 4. Natural sciences, mathematics and informatics from the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria, as follows:

According to group of indicators "A" - 50 items.
According to group of indicators "B" - 214 items.
According to group of indicators "D" - 420 items.
According to group of indicators "D" - 180 items.
According to group of indicators "E" - 226 items.

After getting acquainted with the materials and scientific works presented in the competition, analyzing their significance and the scientific, scientific-applied and applied contributions contained in them, I find it reasonable to give my **positive assessment** and recommend the Scientific Jury to prepare a report-proposal to the Faculty Council of the "Faculty of Physics and Technology" at the PU for the election of Assoc. Prof. Dr. Maria Georgieva Marudova-Zhivanovich to the academic position of "Professor" at Plovdiv University "Paisii Hilendarski" in the field of higher education " Natural sciences, mathematics and informatics", professional direction 4.1. Physical Sciences (Condensed Matter Physics).

6th of April 2021 The review prepared by: .....
Plovdiv (Prof. Dr. Emilia Mitkova Mihaylova)