R E V I E W

by Professor Dr. Iliyan Ivanov Ivanov, Paisii Hilendarski University of Plovdiv

of materials submitted for participation in a competition
for the academic position of *associate professor*

By a decision of the Academic Council of Plovdiv university "Paisii Hilendarski" (State Gazette 98/19.11.2024), a competition has been announced for the academic position of Associate Professor in the field of higher education 4. Natural Sciences, Mathematics, and Informatics, professional field 4.2. Chemical Sciences ("Organic Chemistry, Bioorganic Chemistry"), for the needs of the Department of Organic Chemistry at the Faculty of Chemistry.

One candidate has submitted documents for participation in the announced competition for Associate Professor – Chief Assistant Dr. Mina Mihaylova Todorova from the Department of Organic Chemistry at PU "P. Hilendarski."

1. General presentation of the received materials.

The materials submitted by Chief Assistant Professor Dr. Mina Todorova for the competition have been compiled in accordance with the requirements and are in full compliance with the Regulations for the Development of the Academic Staff of Plovdiv University. The set of documents for the preparation of this review has been provided in electronic form. All stated data and facts are supported by extensive evidence, accompanied by a Declaration of Originality and Authenticity, and provided in the respective Appendices.

2. Brief biographical data of the candidate.

Chief Assistant Professor Dr. M. Todorova obtained a bachelor's degree in chemistry with an additional qualification as a chemistry teacher and a master's degree in medical chemistry from the Faculty of Chemistry at Plovdiv University "Paisii Hilendarski." In 2015, she earned a Ph.D. in organic chemistry after successfully defending her dissertation on "Synthesis, Spectral, and Structural Investigation of New Merocyanine Dyes with Potential Applications in Optical Technologies." Her academic career began in 2007 at the University of Food Technologies – Plovdiv, where she held the positions of Assistant Professor and Chief Assistant Professor in the Department of Organic Chemistry. Since 2021, she has been a Chief Assistant Professor at Plovdiv University, Faculty of Chemistry, Department of Organic Chemistry. Dr. Todorova has extensive research experience, with over 64

publications, 39 of which are indexed in *Scopus* and *Web of Science*. She is proficient in English and German and possesses excellent communication, organizational, and technical skills.

3. General characteristics of the candidates' activities

Dr. Todorova has over fifteen years of teaching experience as an Assistant Professor and Chief Assistant Professor at the University of Food Technologies (2007–2021) and Plovdiv University "Paisii Hilendarski" (2021–2025). During this period, she has taught and continues to teach a variety of courses directly related to her research interests and expertise. As a lecturer at the University of Food Technologies, she conducted practical exercises for bachelor's and master's students in the following subjects: Organic Chemistry, Chemistry of Natural Compounds, General Food Chemistry, Biologically Active Substances, Biochemistry, Chemistry of Food Aroma, Food Chemistry and Processes.She also delivered lectures and seminars in: Chemistry (for international students), Organic Chemistry, Chemistry of Natural Compounds, Chemistry of Food Aroma. Dr. Todorova has contributed to the development of curricula for the course "Chemistry of Food Aroma" for undergraduate students specializing in "Food Analysis, Control, and Ecology" (specialization in Food Chemistry and Microbiology). In collaboration with faculty members from the Department of Organic Chemistry at the University of Food Technologies, she has co-authored two educational manuals to support student learning: Food Chemistry – Laboratory Exercise Manual (UFT, 2022) and Guide to Exercises in Fundamentals of Culinary Chemistry (UFT, 2015).

Chief Assistant Professor Dr. M. Todorova has supervised six students who successfully defended their theses between 2022 and 2024. Her total teaching workload is substantial, amounting to 6,715 hours, with an average of 480 hours per academic year.

Evaluation of the Scientific and Applied Research Activities of Chief Assistant Professor Dr. M. Todorova.

Dr. Todorova has a total of 40 scientific publications in peer-reviewed and indexed scientific journals (SCOPUS, h-index 9, as of 07.02.2025). Her research findings are well-represented within the scientific community through active participation in scientific conferences and forums both nationally and internationally. Between 2023 and 2024, she has

participated as a team member in 15 scientific forums, including: Seven international conferences, Eight national conferences, most of which had international participation. The citations recorded in the documents submitted for the competition amount to 156 (152) (SCOPUS, 166, as of 07.02.2025). All citations are from journals indexed in globally recognized scientific databases, excluding self-citations.

For participation in this competition for the academic position of Associate Professor, the candidate has submitted twenty-four scientific publications (total impact factor: 54.232), which are not part of a dissertation for obtaining a PhD degree. The quartile distribution of the publications is as follows: Q1 – 10 publications, Q2 – 3 publications, Q3 – 6 publications, Q4 – 4 publications, and 1 conference paper. It is particularly noteworthy that a significant portion of the scientific results have been published in prestigious specialized journals with a high impact factor for the scientific field, particularly in the first quartile (Q1), including: *Biomedicines* (IF 3.9, Q1), *International Journal of Molecular Sciences* (IF 4.9, Q1), *Pharmaceuticals* (IF 4.3, Q1), *Toxics* (IF 4.2, 2021), and others. Dr. Todorova is the lead author in four of the publications, the second author in seven, and holds various other authorship positions in the remaining works. Additionally, in five of the submitted publications, she is the corresponding author. Her teaching, scientific, and applied research activities have been further supported by her participation as a team member in nine university and national research projects. The materials submitted by Dr. Todorova for this competition, along with their scientometric indicators, significantly exceed the minimum national requirements and fully meet the additional criteria set forth in the Regulations for the Development of the Academic Staff (RDAS) of Plovdiv University for the academic position of *Associate Professor*.

Group of indicators	**Content**	**Associate Professor – number of points**	**Execution – number of points**
А	Indicator 1	50	50
Б	Sum of the points from indicators 3 and 4	100	170 (indicator 4)
Г	Sum of the points from indicators 5 – 10	200	285 (indicator 7)
Д	Sum of the points from indicator 11	50	304
	Total	**400**	**809**

The research activities of Chief Assistant Professor Dr. Mina Todorova are focused in two areas:

- Synthesis, Structural Characterization, and Investigation of the Biological Activity of Organic Compounds (Dyes), including the preparation of styrylquinolinium compounds and their application as materials for nonlinear optics and pharmacological studies;
- Investigation of the biological activity of propolis and presentation of its pharmacological potential.

As an extended habilitation report, the research is summarized in two areas described in ten scientific papers. The first area of scientific interest is a natural continuation of the research that began during her doctoral studies. Dr. Todorova's research work is focused on the design and synthesis of organic materials with nonlinear optical properties, including the synthesis and structural characterization of styrylquinolinium compounds. These compounds are potential candidates for optical technologies such as lasers, sensors, and photonic devices. Their spectral characteristics, structural parameters, and molecular interactions have been studied, with particular attention given to the relationship between molecular design and nonlinear optical response. In addition to their optical properties, some of these compounds have shown significant anti-inflammatory activity, proven through *in silico*, *in vitro*, and *ex vivo* methods.

The second area is related to the study of the biological activity of propolis. In this regard, Dr. Todorova analyzes the antioxidant, antimicrobial, and anti-inflammatory properties of propolis collected from various geographical regions of Bulgaria. The physicochemical characteristics, flavonoid and phenolic content, as well as the potential for its use as a natural preservative in the food industry, have been evaluated. Her studies also include the use of propolis in biodegradable packaging and edible coatings to enhance the shelf life of food, as well as its role in controlling microbial growth.

Contributions to the study of styrylquinolinium compounds:

- The design and synthesis of new dyes with nonlinear optical properties (NLO-phores) applicable in optical technologies has been developed;
- The influence of donor and acceptor groups on charge transfer in molecules, which improves their optical characteristics, has been studied;
- Six new styrylquinolinium dyes with confirmed anti-inflammatory activity have been synthesized;
- X-ray diffraction was performed on three compounds to determine their structural characteristics;

- A technique for depositing thin layers of dyes using the PLD method has been developed, and their chemical composition and morphology have been analyzed;
- UV-visible and infrared spectra were measured to characterize the absorption properties and intramolecular charge transfer;
- An environmentally friendly method has been developed for the synthesis of silver nanoparticles, applicable as drug carriers, with studied anti-inflammatory, antimicrobial and cytotoxic properties.

Contributions to the study of propolis and its applications:

- An analysis of eighty propolis samples from all twenty-eight regions of Bulgaria was conducted;
- A relationship was established between the geographical origin of the samples and their content of phenols and flavonoids, as well as their antioxidant and antimicrobial potential;
- High antibacterial activity of propolis extracts against Gram-positive bacteria has been proven;
- Edible coatings of carboxymethylcellulose with propolis have been developed to extend the shelf life of food products;
- In the search for new edible coatings, the protective properties of natural biopolymers, including celery pectin, have been investigated for use as an edible coating.
- In addition, the methods used for the analysis of plant extracts have been applied, including to pomegranate blossom, orange tree, and St. John's wort essential oil.

Overall, the scientific research work of Chief Assistant Professor Dr. Todorova is focused on the synthesis of synthetic and isolated natural compounds for applications in materials science, medicine, and the food industry. Her research has significant scientific and practical contributions, combining chemical synthesis, analysis, spectroscopy, structural, and biological studies.

Chief Assistant Professor Dr. M. Todorova demonstrates exceptional competence and innovation in her research. Her contributions combine theoretical depth with practical applications in medicine and the food industry.

4. Assessment of the personal contribution of candidates

As interdisciplinary research, the candidate's work in the competition requires participation in a scientific team that includes specialists from various scientific fields. I assess the candidate's personal contribution to the relevant publications as significant, with a

large part of the formulated contributions and achieved results being her personal achievement.

CONCLUSION

The documents and materials submitted by Chief Assistant Professor Dr. Mina Todorova meet all the requirements of the Law for the Development of Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the Implementation of LDASRB, and the Regulations for the Development of Academic Staff at Plovdiv University "Paisii Hilendarski".

The candidate in the competition has presented a significant number of scientific papers published after the materials used for the defense of the PhD degree. The candidate's works contain original scientific and applied contributions, which have gained international recognition, as the majority of them have been published in authoritative journals specialized in the field of the competition. The theoretical developments have practical applicability, with some directly related to teaching activities. Chief Assistant Professor Dr. Mina Todorova possesses in-depth knowledge and extensive experience in both the scientific and teaching fields.

The results achieved by Chief Assistant Professor Dr. Mina Mihailova Todorova in teaching and scientific research activities fully meet the minimum national requirements as well as the additional requirements of the Faculty of Chemistry, as adopted in connection with the Regulations of Plovdiv University for the application of the Law for the Development of Academic Staff in the Republic of Bulgaria (LDASRB).

After reviewing the materials and scientific papers submitted for the competition, analyzing their significance and the scientific, applied-scientific, and practical contributions contained within them, I find it well-founded to give my positive assessment and recommend to the esteemed Scientific Jury to prepare a report with a proposal to the Faculty Council of the Faculty of Chemistry for the appointment of Chief Assistant Professor Dr. Mina Mihailova Todorova to the academic position of *Associate Professor* at Plovdiv University "Paisii Hilendarski" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional direction 4.2. Chemical Sciences (Organic Chemistry, Bioorganic Chemistry).

10.03.2025 **Reviewer**: .....

Plovdiv Prof. Iliyan Ivanov, PhD