

REVIEW

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external member of the scientific committee, Order ПД-38-13 from 10.01.2024 of the Rector of the Sofia University "Saint Kliment Ohridski"

about: competition for the occupation of the academic position of "associate professor" in scientific field 4. Natural sciences, mathematics and informatics, professional direction 4.2 Chemical Sciences (Analytical Chemistry), announced in GN 103/12.12.2023 for the needs of the Faculty of Chemistry and Pharmacy of the Sofia University "St. Kl. Ohridski"

The only candidate for the announced competition is a head assistant professor Dr. Galina Yotova.

1. Short biography

Dr. Galina Ivaylova Yotova, obtained the BSc degree, specialty "Chemistry and Teacher of Chemistry and Environmental Protection" at the Faculty of Chemistry, SU "St. Kliment Ohridski" in 2010. In 2012, she acquired a master's degree, majoring in "Environmental Chemistry" and was awarded "Outstanding Student". In 2016, she successfully defended her doctoral thesis on the topic "Environmetric and ecotoxicological methods in the assessment of objects from the environment" under 4.2 Chemical Sciences (Analytical Chemistry). She worked as a teacher in the period 2010-2017 in prestigious schools in Sofia. In 2015, she held the position of "assistant professor". After a successful competition in 2016, she held the academic position " head assistant professor" at the Faculty of Chemistry and Pharmacy of SU "St. Kl. Ohridski".

She specialized in Gdańsk University of Technology, Poland (2018). In the period 2019-2020, she is a postdoctoral fellow in the frame of the NP "Young scientists and postdoctoral fellows" with research aimed at assessing anthropogenic impacts on surface waters and water quality in the Mesta River catchment using integral indices and multivariate statistical models.

Dr. Galina Yotova demonstrates remarkable scientific activity: h-index 7 (according to Scopus) with 19 scientific publications and 157 citations; participated in 10 research projects, in 9 international and national scientific conferences.

She speaks English and Russian.

2. Characterization and evaluation of the scientific contributions of the publications presented in Group C, Indicator 4 - "Habilitation work - scientific publications in journals referenced and indexed in world-renowned databases with scientific information (Web of Science and/or Scopus)".

The presented scientific publications are on the topic "Environmetric and ecotoxicological assessment of surface and wastewater". The scientific direction in which Dr. Galina Yotova has research interests is clearly defined. The candidate presents 4 publications on the topic in group C, indicator 4 (publications numbered 1-4). A habilitation thesis on the topic is also presented, which additionally covers publications No. 1-4.

The research on the presented topic (publications No. 1-4) covers the following analytical problems:

1. Analysis of wastewater treatment plants' (WWTP) effluents and their impact on the receiving surface water bodies (Publications No. 1, 2, 4).
2. Survey and assessment of the quality of surface water with a focus on the state of the waters in the Mesta River (publication No. 3).

The main scientific contributions consist in the application for the first time of:

- 1) Multivariate statistical evaluation of WWTP effluents including proportioning of identified sources (Publication No. 2; 3 citations).

The identified groups of similarity between WWTPs by proportioning the loads of the quality indicators against the obtained sources for each of the studied WWTPs show the differences in their technological profiles. The specific information obtained as a result of the research on the composition of the discharged wastewater from each WWTP is the basis for optimizing the wastewater treatment processes, as well as for a detailed analysis of the impact of the WWTP on receiving water bodies.

- 2) A monitoring scheme, including the collection of wastewater samples from WWTPs and the water bodies into which they discharge, with the determination of chemical and physicochemical water quality indicators and the application of ecotoxicological tests, including species from different trophic levels. The obtained data are the basis for subsequent statistical modeling to distinguish wastewater from WWTP and receiving water bodies, and to determine the factors and indicators of water quality relevant to their classification (publication no. 1, 13 citations).

An added value of the application of the combination of appropriately selected ecotoxicological and environmetric methods of analysis is the obtaining of qualitatively new information about the state of water bodies. This information expands the research contributions in the field of wastewater treatment process management and water resources management in Bulgaria.

3) Improved monitoring scheme including sampling of WWTP inlets and outlets and surface water bodies before and after the discharge point (Publication No. 4; 4 citations).

The state of the waters was assessed based on the determination of a wide range of chemical and physicochemical water quality parameters in combination with the selection and application of more sensitive ecotoxicological tests for the given samples. To expand the information obtained, an integral analysis of the data was applied using the method of principal component analysis (PCA) and the method of partial least squares - discriminant analysis (PLS-DA).

4) Development of an approach based on composite water quality index and self-organizing maps (Publication No. 3, 43 citations).

The proposed approach provides more detailed information on the surface water quality of the studied river catchment and makes it possible to establish similar groups of sampling situations, as well as to reveal specific profiles of water quality indices. In addition, temporal changes in water quality can be revealed. The approach was applied to assess the state of the waters of the Mesta River. The results obtained demonstrate the adequacy of the water quality assessment approach and have the potential to assist institutions responsible for managing environmental protection activities. The significance of the obtained results and the relevance of the research are convincingly demonstrated by the high citation rate (43 citations were noted). The proposed approach is a basis for further development with inclusion of additional water quality indicators with the potential for quantitative chemical and/or ecological assessment of the studied water bodies; using the quantitative assessment to analyze anthropogenic impact; appropriate selection of water bodies affected by anthropogenic activity for environmental monitoring.

Proof of the relevance of the research and the high quality of the obtained results is the high rating of the journals in which they were published - Q1, as well as the response in the scientific community - 63 citations were noticed even in a short period (2019-2024).

The candidate's contributions presented in group C, indicator 4 are in the scientific field of the competition.

Group C, Indicator 4: Habilitation work (4 publications, total 100 points).

3. Characterization and assessment of the scientific contributions of the publications Group D, Indicator 7 - scientific publications in publications that are referenced and indexed in world databases with scientific information (Web of Science and Scopus), outside of the Habilitation thesis.

The scientific contributions of the research presented in Group D, Indicator 7, Dr. Yotova summarized in three main directions, with which I fully agree:

1. Environmetric and ecotoxicological assessment of water samples

The publications are a continuation of the research in the habilitation work presented in publications No. 1 to No. 4 (see Group C, Indicator 4). In addition to the studies of the Mesta River (publication No. 3), the results of the studies of the waters of the rivers Ogosta (No. 12) and Maritsa (No. 13) are also presented, as well as a study of the distribution of aluminum in the drinking water network in Sofia (No. 15).

The detailed study on the impact of WWTPs along the Maritsa River on the territory of Bulgaria (publication no. 13; 2 citations) is based on monitoring data and data from own monitoring at sampling points around four WWTPs. The contributions of discharged loads, through the main physicochemical parameters (COD, BOD, total N and total P), to the total loads of the Maritsa River were evaluated. It was established that the main part of the loads from WWTPs originate from the relatively large WWTPs of Pazardzhik and Plovdiv, which do not use nitrogen removal facility and chemical precipitation of phosphorus in their technological schemes. Based on an analysis of the monitoring data, the hypothesis was built that a significant part of the load increase is due to numerous other point and non-point sources such as inflowing rivers and streams. Low ecotoxicity of the surface waters was established.

To assess surface water quality in the Ogosta River and Ogosta Reservoir and the impact of WWTP-Montana, 4 sampling campaigns were conducted (Publication No. 12; 3 citations). The results showed that the treatment process significantly reduced the content of COD, BOD, HB, Cd and Pb, four-time lower content of P and Mn was observed, and moderate to no reduction was observed for some anions and heavy metals. The results of the classical approach are also confirmed by the ecotoxicological analyses, which show low ecotoxicity of all the samples. The conclusion that one of the most widely used bioassays for the analysis of water samples – Daphtoxkit FTM – is not sufficiently indicative and sensitive for uncontaminated samples has been confirmed. An alternative approach using the Phytotoxkit FTM bioassay, was applied.

Publication No. 15 presents the results of a study of the aluminum content in drinking water in Sofia. There is a hypothesis about the relationship between the amounts of aluminum to which the human body is exposed and the Alzheimer's disease. The study reaches important conclusions regarding the quality and sources of aluminum in drinking water in Sofia. Based on an appropriate choice and a combination of statistical approaches, the direct connection between the water

entering the DWTP and the quality of purified water in Sofia has been proven, as well as the disturbing information regarding the urgent need to replace pipelines in areas of Sofia identified in this study. The research lays the foundation for initiating a detailed study of drinking water in Sofia and mapping the problem areas. These studies are of particular importance to society and the responsible institutions.

I am convinced of the personal contribution of Dr. Galina Yotova in these publications. She is the first or second author. The physicochemical parameters included in the monitoring study were determined by the candidate's co-authors (information is provided in the "Contributions" file). The high quality of the results, the persuasiveness of the conclusions based on chemometric approaches, and the scientific and scientific-applied contributions are convincingly proven by the prestige of the journals in which they are published. The results in these publications resonated in the scientific community even in the short period after their publication (5 citations).

2. Environmetric and ecotoxicological evaluation of soil samples and sediments

This direction of research of candidate Dr. Galina Yotova is represented by publications No. 9, No. 10 and No. 14. In two of the articles, Dr. Galina Yotova is the first author. The total number of citations is 35, with publication No. 10 being the most intensively cited.

Contamination of the surface soil layer with potentially toxic elements (PTEs) is a current topic due to their accumulation properties and low degree of bio or geochemical transformation, which can lead to toxic contents in the ecosystem. Determining the geochemical background and threshold values is fundamental to identifying regions with abnormally high PTE values caused by local contamination or geological anomalies, therefore, to determine sampling sites and an adequate monitoring scheme. The development and implementation of a threshold value estimation strategy based on an adequate combination of statistical approaches for analysis and evaluation of monitoring data is at the center of this research (Publication No. 10). In addition, combining established PTE thresholds with geochemical mapping allows identifying priority areas for further assessment and thus focusing efforts and costs where there will be a significant impact. The fact that the work was cited 25 times in renowned journals proves the significance of the obtained results and the relevance of the research.

Specific monitoring of soil and plant samples was conducted in an area with a high concentration of mining and processing activities (Publication No. 9). The bioavailability of heavy metals was evaluated. Using multivariate statistical methods, the factors controlling the transmission of PTE in the studied region were established. The approach used in this study (simplification of metal extraction procedure and intelligent data analysis) offers a new way to assess bioavailability and transfer processes in the complex soil/plant system. In addition, the developed strategy opens new opportunities for reliable environmental risk assessment in a region affected by industrial activity. The work has been cited 7 times, and Dr. Galina Yotova is the leading researcher.

The applicant's experience in developing specific strategies for statistical processing and chemometric analysis of monitoring data has been applied to the assessment of the condition of the Pchelina Dam (Publication No. 14). It was established that the majority of PTE in the dam enters through the Struma River, which is anthropogenically affected, information was also obtained about the dynamics of the anthropogenic impact. Geoaccumulation indices were calculated and ecotoxicity levels were determined by applying a combination of chemical and biological tests. The publication has been cited 3 times in the last two years.

3. Chemometric analysis of data on the toxicity of drug mixtures and packaging materials

This direction is represented by five publications Nos. 5-8, 11. The publications are in the period 2016-2018 and have been cited a total of 31 times. The publications in collaboration with Gdańsk University of Technology, Poland, as well as with established Bulgarian scientists (Prof. V. Simeonov, Prof. S. Tsakovski). The fruitful collaboration creates conditions for enriching the set of ecotoxicological analyses, as well as the multivariate approaches for analyzing data from different types of samples – pharmaceutical mixtures and packaging materials, as can be seen from the presented publications.

A significant contribution is the study of the toxicity of individual components of pharmaceutical substances, taking into account the influence of environmental factors. The synergistic and antagonistic mechanism of activity in complex drug mixtures was studied (publication No. 7). A robust approach is proposed to assess the impact of abiotic factors on the toxicity and endocrine potential of complex mixtures of pharmaceuticals. Research has been extended to evaluating the toxicity of food packaging (Publications Nos. 6,8 and 11). After a specific treatment of the packages, a chemometric analysis of the obtained data was applied to evaluate the influence of the studied model environments on the toxicological response. In subsequent studies, new ecotoxicological tests (Publications No. 8 and No. 11) have been introduced to increase the reliability of the assessment of the toxicity of food packaging materials and the potential risk to the human or animal endocrine system. The obtained results of research in this direction are significant not only for analytical chemistry, but also for research in the field of materials science. A hypothesis has been developed about the substances responsible for the increased toxicity of widely used food packaging materials: composite materials on a metal, cellulose or polymer basis. By combining high-performance liquid chromatography with mass spectrometric detection and chemometric analysis of the obtained multivariate data set, new information has been obtained regarding the release of organic components in foods as a result of the compounds migration from their packaging. An interdisciplinary approach to studying the problem is proposed and guidelines for its implementation are developed.

It can be seen that after the research in direction 3 (2016-2018), Dr. Galina Yotova has established herself as an active researcher with expertise in the field of chemometrics and environmental studies, development and implementation of integral strategies and new combined approaches for

data evaluation and interpretation of analytical information. Proof of this is the fact that in the publications under direction 1 and 2 (described above), published after 2019, Dr. Yotova is the leading author. The contributions of the individual publications in group D, indicator 7 are not only in the field of the competition, but I can confidently say that they are of a multi- and interdisciplinary nature and contribute to the development of other fields of knowledge, such as health science, material science, ecology, toxicology, etc. The relevance of the field in which she works is indicated by the high citation rate, and the quality of the obtained results is proved by the renowned journals in which they are published.

Group D, Indicators 7: Publications outside of habilitation thesis (11 publications, total 230 points).

4. General characteristics and assessment of teaching activities

Dr. Galina Yotova is the author and lecturer of the Analytical Chemistry course for students majoring in BSc "Teacher of natural sciences at the basic level of education". She is a supervisor of practical activities (seminars and laboratory exercises) in the disciplines "Analytical chemistry", "Analytical chemistry with instrumental methods", "Analytical chemistry and methods of analysis", "Chemometrics", "Information technology and statistics", "Environmetrics", "Statistical data treatment", "Applied statistics" for various specialties of the Faculty of Chemistry and Pharmacy, the Faculty of Physics and the Faculty of Biology, BSc and MSc courses. All courses listed are from the compulsory training program. The teaching load of Dr. Galina Yotova for three academic years is impressive, with the classroom activities highly exceeding the required minimum. Along with the academic workload, Dr. G. Yotova is also a supervisor of the students' research activity in the field of chemometrics, environmetrics and ecotoxicology. She is a supervisor of two BSc and MSc diploma theses in the field of ecotoxicological assessment of surface and waste water.

It is clear from the presented documents that Dr. G. Yotova develops active educational and teaching activities in the field of the current competition. In addition, she is active in community service as a member of the National Commission for the National Olympiad in Chemistry and Environmental Protection (from 2020 until now) and the National Commission for the National Competition in Chemistry and Environmental Protection (2018-present).

5. Personal impressions

I personally know Dr. Galina Yotova in my capacity as an external member of a scientific jury for the appointment of the academic position of head assistant at the Faculty of Chemistry and Pharmacy, Sofia University in 2016. I have excellent impressions of the candidate's presentation in the competition. I have no further contact with the candidate and the opinion expressed here is based entirely on the presented materials for the current competition.

6. Compliance with the requirements for occupying the academic position "associate professor".

The presented materials from Dr. Galina Yotova in the competition meet the requirements for holding the academic position "associate professor" of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law and the specific requirements of the Recommendations on the criteria for acquiring scientific degrees and occupation of academic positions in the Sofia University for professional fields 4.2. "Chemical Sciences" and 7.3. "Pharmacy".

The presented materials are precisely designed, comprehensive and give a clear idea of their compliance with the requirements.

In group A - PhD with a dissertation on "Environmetric and ecotoxicological methods in the assessment of objects from the environment" under 4.2 Chemical sciences (Analytical chemistry) (Diploma No. SU2016-125, issued on 29.07.2016) - 50 points.

In group B, indicator 4 – 4 scientific publications in Q1-ranked journals are presented, which are referenced and indexed in world-renowned databases with scientific information (Web of Science and Scopus) evaluated with 100 points (100 points are required). A habilitation thesis is presented, based on the mentioned 4 publications.

In group D, indicators 7 Scientific publications in journals that are referenced and indexed in world-renowned databases with scientific information (Web of Science and Scopus), 11 publications (Q1 – 8; SJR without IF 3 publications) are presented (the papers are not included the habilitation thesis) 230 points (220 points are required).

In group D - 157 citations in scientific publications, referenced and indexed in world-famous databases with scientific information (Web of Science and Scopus) are presented for a total of 314 points (70 points are required), self-citations are excluded. The citations presented are after 2016, when the applicant acquired PhD.

In group G, indicators 21, 22, 23 and 25 - H-index - 7 (SCOPUS) - 70 points; a developed new teaching course (indicator 22) – 10 points; supervision of BSc and MSc thesis - 15 points (indicator 23) and participation in 9 projects (indicator 25) - 45 points; total by indicator G – 140 points (70 points are required).

The candidate head assistant professor Galina Yotova, PhD, meets and even exceeds the requirements for holding the academic position of "associate professor".

7. Critical comments and questions

I have no critical remarks regarding the presented materials, research, and results.

I have the following two questions for the candidate:

1. Given the interest of the scientific community in the presented research results, does Dr. Yotova intend to continue this research and in what direction does she see potential for improvement and/or applicability of the future results?
2. Given the disciplines and topics included in Dr. Yotova's educational activities, whether and in what way she plans to include the obtained research results in her teaching activities?

Conclusion: The materials presented by Dr. Galina Yotova for participation in the competition meet 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 relevant Regulations of the Sofia University "St. Kl. Ohridski", as well as the specific requirements of the Recommendations for the criteria for acquiring scientific degrees and holding academic positions in the Sofia University for professional fields 4.2. "Chemical Sciences" and 7.3. "Pharmacy". The presented research results have original scientific and scientific-applied contributions. A clearly defined area of the research interest of Dr. Galina Ivaylova Yotova is well seen.

I have not noticed any plagiarism in the documents submitted for the competition.

I express my positive assessment of the candidate's activity and recommend the Scientific Jury to propose to the Faculty Council of the Faculty of Chemistry and Pharmacy at Sofia University "Saint Kliment Ohridski" Dr. Galina Ivaylova Yotova to be promoted for the academic position of "associate professor" in 4. Natural sciences, mathematics, and informatics, 4.2. Chemical Sciences (Analytical Chemistry).

April 22nd, 2024