

TO
THE CHAIRMAN OF THE SCIENTIFIC JURY
PROF. DR. PETKO PETKOV

in accordance with Order No. RD 38-13/24.03.2023.
of the Rector of Sofia University "St. Kliment Ohridski"

REVIEW

by prof. Vasil Naskov Atanasov, *PhD (Chem), PhD (Med)*

Faculty of Chemistry and Pharmacy at Sofia University "St. Kliment Ohridski",
Member of the Scientific Jury appointed by Order No. 38-13/24.03.2023.
of the Rector of Sofia University "St. Kliment Ohridski"

SUBJECT: competition for the academic post of Associate Professor,

Field of higher education 4. Natural Sciences, Mathematics and Informatics,
Professional field 4.2. Chemical sciences (Analytical chemistry),
for the needs of the Department of Analytical Chemistry at the Faculty of
Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski",
published in State Gazette No. 103/12.12.2023.

I. INFORMATION ON THE PROCEDURE

In the announced competition participated one candidate - prof. asst. Dr. Galina Ivaylova Yotova.

For the purposes of the competition, Dr. Yotova has submitted all the necessary documents and their review shows that they are in compliance with the requirements of the Academic Staff Development Act of the Republic of Bulgaria (ASDA), the Regulations for its Implementation (RASDA) and the Regulations for the Conditions and Procedure for the Acquisition of Scientific Degrees and the Occupation of Academic Positions at Sofia University "St. Kliment Ohridski" and the Recommendations on the Criteria for the Acquisition of Scientific Degrees and Academic Positions at SU for Professional Fields 4.2 "Chemical Sciences":

1. The candidate has obtained a Ph.D.
2. She has held the academic position of "Senior Assistant Professor" for at least two years.
3. Submits a habilitation thesis according to the recommendations for criteria in the relevant field of the academic community of Sofia University "St. Kliment Ohridski".
4. Meets the minimum national requirements and those recommended by the above sources.
5. There is no proven plagiarism in scientific papers.

II. PRESENTATION OF THE CANDIDATE. ACADEMIC CAREER

Dr. Galina Yotova graduated with excellent grades from the National School of Natural Sciences "Acad. Lyubomir Chakalov", Chemistry and Mathematics. She graduated as a Bachelor of Chemistry and a teacher of Chemistry and Environmental Protection at the Faculty of Chemistry of Sofia University "St. Kliment Ohridski" (2010) and graduated with honors from the Master's program in Environmental chemistry at the same university. The candidate obtained a PhD degree at the Faculty of Chemistry and Pharmacy of SU in 2016 after defending a dissertation on "Environmetric and ecotoxicological methods in the assessment of environmental objects". Dr. Yotova specialized at Gdańsk University of Technology, Poland in 2018, and in 2019-2020 she is a postdoctoral fellow of the NP "Young Scientists and Postdoctoral Fellows"

Dr. Yotova holds academic positions of Assistant Professor (2015-2016) and Senior Assistant Professor (2016-present) at the Faculty of Chemistry and Pharmacy, teaching in both undergraduate and graduate programs.

In the documents submitted for participation in the competition, the candidate has provided a detailed and up-to-date account of her professional development and qualifications, as well as of her teaching and research activities.

III. RESEARCH ACTIVITIES OF THE CANDIDATE

1. Quantitative criteria and requirements

For her participation in the competition Dr. Galina Yotova submitted 15 scientific publications of which 4 (indexed in Scopus and with rank Q1) meet and fulfill the requirement for indicator "C", and 11 publications for indicator "D", of which 8 with rank Q1 and three - in indexed publications without rank. Of the publications submitted for the competition, 13 had been cited at the time of the report, with the total number of citations exceeding the threshold for indicator E by many times. A reference to the SCOPUS database of scientific information (on 17.04.2024) shows the Hirsch index (h-index) for the candidate (Scopus Author ID 57185731800) has a value of 7.

In the assessment of the mandatory minimum scientific-metric indicators for the academic position "Associate Professor" in field 4. Natural Sciences, Mathematics and Informatics, the candidate has provided the following summary:

Number and content of indicator	Total points	Minimum national requirements	Recommended Requirements by the Faculty
Group of indicators A			
Indicator 1: Dissertation for the award of the educational and scientific degree "PhD"	50	50	50
Group of indicators B			
Indicator 2: Dissertation for the award of the degree of Doctor of Science	-	-	-

Group of indicators B			
Indicator 4. Habilitation work - scientific publications in publications that are refereed and indexed in world-known databases with scientific information (Web of Science and Scopus)*	100		
total group of indicators B	100	100	100
Group of indicators D			
Indicator 7. Scientific publications in journals that have been refereed and indexed in world-renowned databases of scientific information (Web of Science and Scopus), beyond the habilitation thesis*	230		
total indicator group D	230	200	220
Group of indicators E			
Indicator 11. Citations in scientific journals, monographs and collective volumes referenced and indexed in world-renowned databases of scientific information (Web of Science and Scopus)	314		
total group of indicators E	314	50	70
Group of indicators E			
Indicators 12-20	-	-	-
total group of indicators E	0		
Group of indicators G			
Indicator 21. h-index (7 × 10)	70		
Indicator 22. Number of new courses introduced (1 × 10)	10		
Indicator 23. Number of graduates (1.5 × 10)	15		
Indicator 25. Participation in research projects (9 × 5)	45		
total group of indicators G	140	not required	70

The assessment of Dr. Yotova's science metrics shows that she meets and exceeds the minimum national requirements, as well as meeting the institutional criteria and recommendations for the academic position for which the competition was announced.

2. Evaluation of the candidate's scientific production

The scientific publications and habilitation extended reference submitted to the competition show that the research conducted is complex and interdisciplinary in nature, fully meeting academic standards. They clearly illustrate and outline the areas in which Dr. Yotova's research activity is focused, namely:

- 1) *Environmetric-and ecotoxicological assessment of water samples [1-4, 12, 13, 15]*

The object of the research are wastewater treatment plants (WWTPs) and, more specifically, the analysis of the wastewater treated by WWTPs and its impact on the receiving surface water bodies. Surface waters in the catchment areas of the rivers Mesta, Ogosta and Maritsa are the subject of separate studies. In addition, one of the publications relates to the distribution of aluminium in the water supply network of the town of Sofia.

In addition to the in-depth chemometric analysis, numerous ecotoxicological studies have been performed by the applicant, resulting in original results e.g. ecotoxicity assessment of water samples using a battery of selected bioassays in which the test species are from different trophic levels. An additional ecotoxicological test was also conducted using the Ostracodtoxkit F™, which measures growth inhibition (GRINH) and mortality (MORT) of the crustacean species *Heterocypris incongruens*. The observed mortality and growth inhibition of the crustacean species *Heterocypris incongruens* are explained by general physicochemical parameters (such as COD, TSS, pH), as ostracods are highest in the trophic chain (among the organisms studied) and have a fully developed gastrointestinal tract where digestion of suspended solids occurs, which are an important source of metals and organic contaminants.

Tests with algae, bacteria and plants are the most commonly used ecotoxicological tests in such monitoring, but they are characterised by specific limitations due to the acute toxicity they assess and the use of mostly lower trophic level organisms. From the study conducted, it appears that the bioassay using *Heterocypris incongruens*, although designed to assess the toxicity of solid samples, is applicable for the supersensitive assessment of toxicity levels of liquid samples when appropriate modifications are in place and validated for this purpose.

2) *Environmetric and ecotoxicological assessment of soil samples and sediments [9, 10, 14]*

Studies related to the national soil monitoring network have focused on contamination of surface soil with potentially toxic elements (PTEs), which is a serious environmental problem due to intensive anthropogenic activities such as industrialization, urbanization and agriculture. The concentration of PTEs in soils is an issue that is being addressed with great care due to their accumulation properties and inability to decompose, which can lead to toxic levels in the ecosystem. In environmental geochemistry, geochemical background and threshold values are used to identify sampling sites with unusually high concentrations of PTEs. High concentrations of elements in soil may be due to natural phenomena such as mineralization, unusual rock types, etc. or may be caused by human activities.

A series of analytical, graphical and mathematical approaches were used to establish background and threshold values of PTE in the surface soil layer in Bulgaria. Data on the content of 8 PTEs (As, Cd, Cr, Cu, Hg, Ni, Pb and Zn) in 348 sampling points from the national soil monitoring network (orthogonal network with a cross-section of 16 km throughout the country) at a depth of 0-20 cm were used in the period 2004-2005, 74.7% being arable land and 25.3% permanent grassland.

In this group of studies, it is worth mentioning the study of sediment cores from the Pchelina dam [14], which evaluated the anthropogenic impact of the industrial areas of Pernik and Radomir since the boiling of the dam in 1972.

3) *Chemometric analysis of toxicity data of drug mixtures and packaging materials [5-8, 11].*

Hormones and pharmaceuticals are modern environmental pollutants whose levels in ecosystems are imperative to monitor, especially due to the interactions occurring between them under abiotic environmental factors. This raises the need to determine the mixed ecotoxicological effect of a combination of two drugs, which proves to be a complex task. Compounds that have similar effects behave as mixtures, whereas those that act differently elicit an independent toxic response. If an interaction exists between substances in the mixture, it may be synergistic or antagonistic. In the absence of interaction, the combined effect can be predicted from the expected effect of each component in the mixture according to its mode of action.

Drug mixtures are the object of analysis in some of the presented publications. Ecotoxicological evaluation was performed using the Microtox® and XenoScreen YES/YAS® bioassays (by co-authors) of 9 drug substances (diclofenac (sodium salt), oxytetracycline hydrochloride, fluoxetine hydrochloride, chloramphenicol, ketoprofen, progesterone, estrone, androstenedione and gemfibrozil) present in the environment at specific concentration levels and their mutual combinations in pairs.

Research related to the toxicity assessment of food packaging has focused on modeling the relationship between organics migrating from packaging into model environments and their toxicological response. Of note is the use of the chemometric method Analysis of Variance Simultaneous Component Analysis (ASCA), which reduces the dimensionality of the data when conducting analysis of variance.

A detailed analysis of the author's research, achievements and conclusions from the performed experiments, as well as on the basis of the processing of the obtained results is presented in the attached author's reference for the contributions of the scientific works of the head asst. Dr. Galina Ivaylova Yotova, attached to the set of documents, as well as from the abstracts of the publications submitted for participation in the competition.

Extremely competent and thorough use of multiple chemometric approaches has been demonstrated, as well as application of experimental protocols for ecotoxicological studies (Microtox®, Phytotoxkit F™, Daphtoxkit F™, Ostracodtoxkit F™, XenoScreen YES/YAS®).

3. Habilitation thesis

The author's extended habilitation report (habilitation thesis) on "ECOMETRICAL AND ECOTOXICOLOGICAL ASSESSMENT OF SOIL AND WASTEWATER" is presented in 40 pages and includes 59 references.

The majority of the publications in the habilitation thesis [1, 2 and 4] are related to the environmetric assessment of wastewater and their impact on receiving water bodies. Surface water quality parameters that are most significantly affected by the discharge of wastewater treated by wastewater treatment plants (WWTPs) have been identified. Proportioning of WWTP discharges according to identified pollution sources has also been carried out [2].

The proposed new approach for assessing water quality in a river catchment through the joint use of the Canadian Council of Ministers of the Environment's Combined Water Quality Index (WQI) and Kohonen's Self-Organizing Maps (SOM) has been published in [3], which is also the most cited publication from the list submitted by the applicant for this competition (43 citations). The study included monitoring data for 10 sampling sites from the Mesta river catchment between

2008 and 2018, which were assessed with 9 physico-chemical water quality indicators. WQI was calculated based on 3 factors (scope, frequency and amplitude). The proposed new approach, provides more detailed information on the surface water quality of the study catchment by combining the multivariate SOM and WQI approach. The use of the 3 factors derived from the WQI calculation as variables in the application of the SOM enables (i) finding similar groups of sampling situations in the studied river basin; (ii) revealing specific WQI profiles for different groups of sites. In this way, different WQI profiles representing specific water quality situations can be delineated. In addition, temporal changes in water quality and similarity between sampling sites in the catchment can be detected. The results confirm that combining a multivariate approach such as SOM with the factors used in WQI calculation is a suitable strategy for assessing water quality in a river basin and has the potential to assist environmental institutions in river basin management activities. The proposed approach offers a number of opportunities for further improvements, namely (i) flexibility in terms of including additional water quality indicators (priority pollutants, hydrological, biological indicators) that could lead to a quantitative chemical and/or ecological assessment of the water bodies under study; (ii) the use of quantification to analyse anthropogenic pressures and their impact on water bodies; and (iii) the selection of water bodies affected by anthropogenic activities for exploratory monitoring.

IV. TEACHING AND OTHER ACTIVITIES OF THE CANDIDATE

Dr. Galina Yotova presents a considerable amount of teaching, project and expert activity.

1. Teaching activity

From the presented reference for three academic years (2018/2019; 2019/2020; 2020/2021) it is seen that the Dr. Yotova significantly exceeds the threshold of Sofia University "St. Kliment Ohridski" for academic employment, submitting a certified reference for her academic employment with more than 500 hours in two of the mentioned years.

Dr. Yotova is engaged in a lecture course in Analytical Chemistry for the Bachelor's degree program "Science Teacher in the Basic Education Degree", as well as in numerous practical (seminar and laboratory) exercises for a number of basic and elective courses at the Faculty of Chemistry and Pharmacy (Analytical Chemistry; Analytical Chemistry with Instrumental Methods; Chemometrics; Ecometry; Statistical Data Processing; Applied Statistics, etc.).

Dr. Yotova is a scientific supervisor of two successfully defended graduates, as well as a supervisor of students in cross-curricular activities and pre-degree internship.

2. Project activity

The candidate in the current competition - Dr Galina Yotova presents a list of participation as a member in 10 projects for the period 2013 - 2023, all of which are directly related to Dr Yotova's research topic.

3. Expert activity

Dr. Yotova is a member of the National Commission for organizing and conducting the National Competition in Chemistry "Test Problems for High School Students" - from 2018 until now.

From 2020 to the present, Dr. Yotova is a member of the National Commission for organizing and conducting the National Olympiad in Chemistry.

V. CONCLUSION

The materials submitted for the competition meet and exceed the requirements of the Law for the Development of Academic Staff in the Republic of Bulgaria, the Regulations for its implementation, as well as the Regulations for the Conditions and Procedure for the Acquisition of Scientific Degrees and the Occupation of Academic Positions at Sofia University "St. Kliment Ohridski" and the Recommendations on the Criteria for the Acquisition of Scientific Degrees and Academic Positions at SU for the Professional Field 4.2 "Chemical Sciences".

The candidate in the current competition - Dr. Galina Yotova has a significant amount of scientific research and teaching activity. She is a well-established researcher and lecturer with her own character in the academic activities she develops, which fully fit into the traditions of the Department of Analytical Chemistry at the Faculty of Chemistry and Pharmacy of Sofia University "St. Kliment Ohridski".

In addition to the above, and together with my personal impressions of the colleague, **I strongly support the choice of Dr. Galina Ivaylova Yotova for the academic position of Associate Professor, professional field 4.2. Chemical sciences (Analytical chemistry) and I give my positive evaluation for her choice.**

20.04.2024.

Sofia

Reviewer:

/Prof. Dr. Vasil N. Atanasov/