

R E P O R T

on the competition for the academic position Associate Professor scientific direction 4.2. Chemical Sciences (Analytical Chemistry)

Faculty on Chemistry and Pharmacy at the Sofia University (FCF-SU)

announced in ДБ, N 104 / 15.12.2023

Applicant: **Dr. Veronika Valentinova Mihaylova** (FCF-SU)

Member of the Scientific Jury: Prof. Dr. Radostina Konstantinova Stoyanova (IGIC-BAS)

A. Report on the fulfillment of the minimal criteria

In the competition for associate professor, Dr. Mihailova participated with a habilitation thesis based on 6 scientific papers dedicated to the methodological elaboration of inductively coupled plasma mass spectrometry (ICP-MS) as a tool for environmental monitoring of mineral/spring waters and sediments. Publications were published in refereed international journals, with 33% of them in the top 25% in the field of chemical sciences. Along with them, Dr. Mihailova presents 15 scientific works, in which the emphasis is on the application of mass spectral and X-ray methods for the analysis of archaeological artefacts and antitumor drugs based on platinum. These works were published in refereed journals ranked as follows: Q1 - 40%, Q2 - 13%, Q3 - 34% and Q4 -13. So far, 92 independent citations have been noticed on the works of Dr. Mihailova. Over the past 15 years, Dr. Mihailova has participated in a total of 11 research projects with various sources of funding, such as FNI, NNP at the MES, OP NOIR, etc. The overall Hirsch index of Dr. Mihailova's scientific output is 6.

In parallel with the research activity, Dr. Mihailova has a teaching activity, expressed in teaching lecture courses and practical classes in analytical chemistry and analytical chemistry of the environment, as well as a lecture course in applied statistics. Also, Dr. Mihailova supervised five graduate students who successfully defended their theses. Dr. Mihailova's teaching activities fully cover the topic of the announced competition in analytical chemistry

The report's data reveal reveals that Dr. Mihailova's scientific output is on the subject of the competition and exceeds the minimum national requirements for holding the academic position of "associate professor" in the field of "Natural Sciences, Mathematics and Informatics", branch of Chemical Sciences, specified in the Development Act of the academic staff in the Republic of Bulgaria, the Regulations for its application and the Regulations for the terms and conditions for acquiring scientific degrees and occupying academic positions at SU.

B. General features of the applicant's research activities

B1. Main scientific contributions presented in the habilitation thesis. The ecological monitoring relies on the introduction of suitable methods of chemical analysis, which make it possible to simultaneously determine several chemical elements in wide concentration ranges. This is the main contribution of Dr. Mihailova – development of the ICP-MS method for

determining macro-, micro- and trace elements in natural waters and sediments. The most important results can be divided into three groups: (a) the instrumental parameters of the spectrometer were optimized so as to suppress the signal of the analyte during the determination of macroelements, (b) the proposed analytical methodology was applied in determining the chemical composition of Bulgarian brands of mineral and spring waters; (c) appropriate statistical methods (such as cluster analysis, least squares discriminant analysis) have been applied for clearer elemental differentiation of natural objects, as well as for formulating concentration cadastres of the analysed elements in drinking bottled waters. This water research approach has been adapted to monitor a wide range of natural objects, such as sediments, soils and plants. As a result, it has been demonstrated the degree of anthropogenic pollution in the area around the Tsar Asen mine and the response of the dandelion plant species to the pollution. In conclusion, Dr. Mihailova's research assists in expanding the capabilities of inductively coupled plasma mass spectrometry as an analytical method for ecological monitoring of water, soils, sediments, and plants.

B2. Scientific contributions presented in the non-habilitation thesis. These studies can be divided into two subgroups: archaeometric and complexometric studies. The link between them is the application of mass spectral and X-ray methods for chemical analysis of the studied objects. The first group is based on the investigation of the gold objects from the Great Mound in Sboryanovo (dating from the last decades of the 4th century BC) and copper belt accessories (dating from the 3rd – 7th centuries AD). Chemical analysis shows that the objects from Sboryanovo contain more than 93.5% gold, which enables to consider that the objects are made of refined gold of different origin. The research provides valuable information about the chemical profile of the artefacts, which can be linked to potential regional features and ethnicity. The studies on the cytotoxic activity of platinum complexes can be attributed to the second group. The ICP-MS method was applied and validated for the determination of trace concentrations of Pt accumulated in different types of cell cultures as well as in different cell fractions. The information from these studies allows insight into the pharmacotherapeutic potential of Pt(II) nanocapsules and Pt(IV) pyrenebutyric complexes compared to the conventional drug cisplatin. Dr. Mihailova's research was performed in a team with scientists from other scientific organizations, but her role was well defined: she participated in planning and conducting the experiments, as well as in the application of statistical methods to analyse the results.

C. Conclusion

The methodical development of mass spectrometry with inductively coupled plasma as a tool for chemical analysis of objects from the environment, archaeological artefacts and biologically active complexes is a main feature of the overall research and teaching activity of Dr. Mihailova. Determining the chemical composition of the various types of objects is an important step for the subsequent rational interpretation of ecological, archaeological and pharmacotherapeutic problems. These studies clearly outline the contribution of Dr. Mihailova as a specialist in the field of chemical analysis. Dr. Mihailova's scientific output exceeds the minimum national requirements for holding the academic position of "associate professor" in the field of "Natural Sciences, Mathematics and Informatics", Department of Chemical

Sciences. In addition to research activities, Dr. Mihailova participates in the teaching activities of the Analytical Chemistry Department at the FHF-SU. All this gives me the reason to strongly suggest to the Scientific Jury to award Dr. Veronika Mihailova the academic position of "Associate Professor" in Analytical Chemistry.

18.04.2024

Radostina Stoyanova