R E P O R T

on the competition for the academic position Professor
scientific direction 4.2. Chemical Sciences (Analytical Chemistry)
Faculty on Chemistry and Pharmacy at the Sofia University (FCF-SU)
announced in ДВ, N 103 / 12.12.2023

Applicant: **Assoc. Prof. Dr. Galina Georgieva Gencheva - Kisiovska** (FCF-SU)

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

A. Report on the fulfillment of the minimal criteria

Dr. Gencheva participated in the competition for professor with a habilitation thesis based on 4 scientific papers devoted to identification of the structural peculiarities of complexes of platinum and palladium by a combination of diffraction, spectroscopic and magnetic methods. All publications were published in refereed international journals ranked in the top 25% in the field of spectroscopy and pharmacology (Q1). Along with them, Dr. Gencheva presents 15 scientific papers in which the relationshipc between synthesis, structure and pharmaceutical properties of complexes of copper, gold, ruthenium, platinum and palladium is examined. These papers were published in refereed journals ranked as follows: Q1 - 13%, Q2 - 27%, Q3- 13% and Q4 - 47%. The developed method for the preparation of potassium tetrachloroplatinate is protected by a patent. Dr. Gencheva's research resonates in scientific community, where 64 independent citations of her publications are presented in the competition. For the development of her research activity, the participation of Dr. Gencheva in projects with various sources of funding (FNI, OP NOIR) is essential, of which she is the leader of 2 of them. The overall Hirsch index of Dr. Gencheva's scientific output is 9.

Along with the research activity, Dr. Gencheva has an active teaching activity, expressed in the guidance of two successfully defended PhD students, consultant of one PhD student and supervisor of graduate students. Also, Dr. Gencheva participated in a co-author in the preparation of two textbooks. She teaches bachelor courses in analytical chemistry and instrumental methods (part 1), instrumental methods (part 2), methods of vibrational spectroscopy and complexes in analytical chemistry, as well as master's courses in the application of molecular spectroscopy in chemical analysis, modern methods of molecular spectroscopy and electrochemical methods of analysis. These academic disciplines fully cover the topic of the announced competition.

The report’s data reveal that Dr. Gencheva's scientific output is on the subject of the competition and exceeds the minimum national requirements for occupying the academic position of "professor" in the field of "Natural Sciences, Mathematics and Informatics", branch of Chemical Sciences, specified in the Law on Development 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 utilization of coordination compounds as antitumor drugs depends critically, on the one hand, on the introduction of innovative synthesis methods and approaches that allow the components to be structured in a certain way to achieve synergy between them, and on the other hand, on the rational application of a combination of analytical methods allowing to understand the structure of the complexes at the molecular level. This is the main contributions of Dr. Gencheva – targeted synthesis of coordination compounds of platinum and palladium with polydentate ligands such as hematoporphyrin IX (Hp) and 1,3,5-triamino-1,3,5-trideoxy-cis-inositol (taci) and methodical determination of their molecular structures by electron paramagnetic resonance, nuclear magnetic resonance, infrared spectroscopy and diffraction methods. As a result, specific methods were developed for the controlled preparation of a metalloporphyrin complex of Pt(III) with Hp, a dinuclear complex of Pd(III) with Hp and the taci:Pt(IV)=1 complex, which show selective pharmacological properties thanks to their different molecular structures. This allows the isolated complexes to be used in specific therapies.

In conclusion, Dr. Gencheva's research assists in revealing new relationships between synthesis methods and structural properties of platinum and palladium complexes, and on the other hand, contributes to enriching knowledge on the use of coordination compounds with biological activity. The proposed research methodology (i.e., synthesis-molecular structure-pharmacological properties) could be used as an approach in the elaboratoion of new antitumor drugs.

B2. Scientific contributions presented in the non-habilitation thesis. These studies can be divided into three subgroups. The first group is based on the application of spectroscopic and diffraction methods for the analysis of the molecular structure of complexes and purposefully selected ligands under different equilibrium conditions. Complexes of Cu(II), Au(II), Fe(II) and Fe(III) with hematoporphyrin IX, as well as ligands based on phosphine oxides, are the subject of research. The second group is aimed at determining the structure of coordination compounds by single crystal diffraction. A new phase in Dr. Gencheva's research is the application of vibrational spectroscopy for the examination of functional groups of graphene and plant samples. The data obtained serve as a basis for insight into the physicochemical properties of above materials.

Dr. Gencheva's research was performed in a team with scientists from other scientific organizations, but her role is well defined: she participates both in the planning and implementation of scientific tasks, and in formulating new directions in the research development.

C. Conclusion

The main features of the overall research and teaching activities of Dr. Galina Gencheva is the systematic and target study of the molecular structure of complexes in the liquid and solid state by applying a combination of spectroscopic and diffraction methods. Knowledge of the molecular structure is rationally coupled with the development of new antitumor drugs. The

research clearly outlines the role of Dr. Gencheva as a leading scientist, namely the original development of the methods of synthesis and structural characterization of metal-organic complexes in order to match their properties to a given medical application. The data of these studies could serve as further guidelines for the study of other metal-organic complexes. Dr. Gencheva's scientific output exceeds the minimum national requirements for holding the academic position of "professor" in the field of "Natural Sciences, Mathematics and Informatics", Chemical Sciences. Another feature is her active teaching activity in the field of the analytical chemistry and instrumental methods of chemical analysis. All this gives me the reason to most convincingly suggest to the Scientific Jury to award Assoc. Dr. Galina Gencheva the academic position of "Professor" in Analytical Chemistry.

15.04.2024 Radostina Stoyanova