

STATEMENT

in competition for a professorship in
4.2. Chemical Sciences (Analytical Chemistry)
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with candidate Assoc. Prof. Dr. Galina Georgieva Gencheva - Kisovska

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In the competition for Professor of Analytical Chemistry at the Faculty of Chemistry and Pharmacy of Sofia University participated one candidate - Assoc. Prof. Dr. Galina Georgieva Gencheva - Kisovska. Galina Gencheva is a graduate of the Faculty of Chemistry of Sofia University "St. Kliment Ohridski". In 1993 she defended her dissertation for the degree of Doctor of Science and Education at the Faculty of Chemistry on "Complexation of the bioligand creatinine with nickel, palladium and platinum in aqueous and organic media".

Galina Georgieva Gencheva has been working at the Department of Analytical Chemistry of the Faculty of Chemistry of Sofia University since 1986 as a graduate student, full-time PhD student (1988-1992), assistant professor, senior assistant professor, principal assistant professor, and in 2004 she was elected associate professor in the same department.

The scientific activity of Assoc. Prof. Dr. Galina Georgieva Gencheva - Kisovska includes 52 scientific publications, 40 of which are in refereed international and Bulgarian journals. She is a co-author of 2 textbooks. In 11 publications she is a corresponding author, in 2 of them she is the first author.

In the current competition she is involved in 22 publications: 6 - Q1; Q2 - 4; Q3 - 2; Q4 - 4; Q4 (SJR) - 3; 1 publication in an edited collection; 1 - in a journal indexed after 2012; 1 patent.

A total of 284 citations have been noted on Galina Gencheva's work, (h index - 9), 63 of the citations are on publications included in the current competition. The candidate has submitted a habilitation thesis entitled: Instrumental methods for molecular structure determination - application in modeling of non-classical antitumor drugs.

Assoc. prof. Gencheva is the head of 2 scientific projects and participant in 1 project with FNI - Ministry of Education and Science, as well as the head of 4 projects with FNI of Sofia University. Kliment Ohridski", for the competition she submitted participation in four projects. She is the supervisor of two and advisor of one successfully defended PhD students, as well as the supervisor of nine diploma theses.

The teaching activity of Assoc. Gencheva covers courses at the Department of Analytical Chemistry of the Faculty of Physics and Chemistry: undergraduate programs - Analytical Chemistry and Instrumental Methods - 1 , Instrumental Methods - 2 , Methods of Vibrational Spectroscopy, Complex Compounds in Analytical Chemistry, Analytical Chemistry I and II ; graduate programs - Modern Methods of Molecular Spectroscopy, Modern Applications of Molecular Spectroscopy in Chemical Analysis.

The research of Assoc. Gencheva includes the application of a large number of modern instrumental methods for the determination of molecular structure and for the study of equilibria in solutions. The equilibria of a series of complexation reactions as well as the parallel redox processes have been studied as well. Targeted synthesis of new transition metal complexes with potential for application as antitumor drugs, which can be considered as an alternative to platinum drugs, has also been carried out. In this report I will focus on some of the more important, in my opinion, scientific achievements and contributions of the candidate.

Complexes of Pt(III) with hematoporphyrin IX have been obtained and structurally characterized for the first time. The reaction conditions of synthesis: solvent, pH, starting complex of Pt(II) have been determined, and the mechanism of the complexation reaction has been proved. The complexes formed in solution were isolated in the solid phase and their structure was studied. By means of EPR and UV/Vis spectroscopic studies, the structure of the complexes in solution was shown to be consistent with that in the solid phase.

In other work by the candidate, complexes of Pd(III) with hematoporphyrin IX have been prepared and structurally characterized, again with potential application as antitumor drugs. A suitable reaction system was similarly specified, and the metal/ligand molar ratios were optimized. The composition of the complexes and their crystal structure have been reliably demonstrated by appropriate spectroscopic and thermal methods. The structure of the complexes in DMSO and DMF solutions was also shown to be consistent with that in the solid phase. Following a similar analytical strategy, a paramagnetic complex of Au(II) with hematoporphyrin was synthesized and structurally characterized. Very good agreement of experimental with simulated spectra was obtained and a high degree of covalency of the Au-N(Hp) bond was demonstrated.

In other 2 works of Assoc. Gencheva have studied complexes of Pt(IV) with the ligand 1,3,5-triamino-1,3,5-trideoxy-cis-inositol (taci, all-cis-2,4,6-triaminocyclohexane-1,3,5-triol). The complexation process in aqueous medium was studied, and it should be noted that the refinement of the reaction conditions in the synthesis of the complex represents a scientific

contribution. The structure of the complex in the solid phase as well as in solution has been reliably demonstrated and its stability has been determined.

The synthesized and structurally characterized complexes of platinum, palladium and gold were also investigated for cytotoxicity, with a focus on studying the effect of molecular structure on the mechanisms of cytotoxicity. The cytotoxic activity of the complexes was evaluated against a series of human tumor cell lines (leukemia, lymphoma, osteosarcoma and solid tumors) as well as manufactured resistant cell lines and compared to that of the reference drug cisplatin. The results obtained proved that the effects of the new complexes were commensurate with those of cisplatin, and for some malignant cells they exceeded them. The results from the study of the biological properties of some of the synthesized complexes prove their pharmacological properties, a prerequisite for the creation of new drug formulations specific to certain cell lines.

In order to select a suitable ligand for targeted complexation, the appropriate conditions for specific coordination of different ligands were studied. For example, four ligands containing two donor groups, a primary amino group and a tertiary phosphine oxide group, were investigated for complexation with Pd(II). The effect of tertiary phosphine oxide groups in the ligand molecule has been demonstrated by comparing the protolysis properties of ligands with similar structure but without tertiary phosphine oxide group. A combined theoretical and experimental study of the coordination ability of tertiary phosphine oxides has also been carried out and important results on the reactivity of different functional groups of the ligand have been obtained.

Notable are also the results of Assoc. Gencheva on the application of vibrational spectroscopy and X-ray diffraction to determine the physicochemical properties and structure of new materials (graphene materials) and natural products (herbs). In these studies, the contribution of Gencheva is also clearly outlined, and consists mainly in the interpretation of the IR and Raman spectra, as well as in the determination of the structural parameters of the investigated substances.

For the competition Assoc. Gencheva has submitted a habilitation thesis entitled "Instrumental methods for molecular structure determination - application in modeling of non-classical antitumor drugs". It is based on 4 publications (Q1), in which Gencheva's role as a researcher is leading and there is no doubt about her main scientific contribution. Briefly, the presented habilitation thesis is devoted to the possibilities and areas of application of a group of instrumental methods for the control of preparation processes, structural characterization and study of physicochemical properties of target-derived new compounds. The research is focused

on new metal complexes designed for antitumor preparations. The results obtained from the cytotoxicity studies of new compounds conducted with the participation of Gencheva reveal a real potential in the search for new drug formulations among coordination compounds. However, to accomplish biological experiments on the complexes, precise characterization of their structure and properties is necessary, for which Assoc. Gencheva applied appropriately selected instrumental methods for analysis.

In summary, considering the leading role of Assoc. prof. Gencheva in the research conducted with her participation and her well-defined scientific contribution in the joint publications, I believe that she is an accomplished scientist capable of leading independent research, as well as to manage a scientific group in a topical scientific area - synthesis and characterization of complex compounds with biological and pharmacological activity.

Based on the above I propose that Assoc. Prof. Galina Georgieva Gencheva - Kisovska be elected Professor of Analytical Chemistry at the Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski".

18.04.2024.

Prof. DSc. Tony Spassov