

## REFERENCE STATEMENT

within the call for **Professor position** in 4.2 Chemical sciences (Analytical Chemistry)  
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by Prof. Dr. **Anela Nikolova Ivanova**  
Sofia University, Faculty of Chemistry and Pharmacy,  
member of the scientific jury appointed with Order № RD 38-12 from 10. 01. 2024  
of the Rector of Sofia University

There is a single applicant for the position – Assoc. Prof. Dr. Galina Gencheva-Kisyovska. She has been employed at Sofia University, Faculty of Chemistry and Pharmacy (SU, FCP) since 1992 and has occupied an “Associate Professor” position for the last nineteen academic years. In 1993, she has been awarded a PhD degree after successful defense of a thesis “Coordination of the bioactive ligand creatinine with nickel, palladium and platinum in aqueous and organic medium”. Since 2023 she has been Vice-dean of FCP for quality assurance, accreditations and relations with employers. All required documents are available, together with information on additional criteria related to the selection procedure.

Dr. Gencheva-Kisyovska is a co-author of 52 scientific articles, 46 of which published in international peer-reviewed journals (Source: Web of Science), of 2 textbooks for higher education and of 1 international patent. She is also the author of 9 topics in a high school specialized textbook. She has submitted for the selection procedure 21 publications and 1 patent (18 articles published in international peer-reviewed journals). None of these has been used for the position of Associate Professor or for the PhD degree. Hence, in line with Art. 29, Sec. 1, P. 3, 4 of the Law for promotions in academia in Bulgaria (LPAB), they are eligible for evaluation of the scientific contributions of the applicant. The articles are published in journals specialized in the area of the study or with a more general profile. The patent is international and protects a method for the synthesis of a bioactive complex ( $K_2PtCl_4$ ). The publications submitted for assessment have been cited 66 times in international peer-reviewed journals. The total number of independent citations of the publications of Dr. Gencheva-Kisyovska is 172 (Source: Scopus). She has had several short-term specializations abroad, one of them funded by DAAD. The applicant has coordinated 2 national and 6 university research projects and has participated in 1 international and 2 national research projects. Dr. Gencheva-Kisyovska has supervised 2 PhD students and 9 successfully defended diploma theses. Dr. Gencheva-Kisyovska has presented her results at 10 scientific events as 3 oral presentations (1 invited lecture) and 7 posters. She is a reviewer for international journals, member of the Bulgarian crystallographic society and an editor for the journal Bulgarian Chemical Communications. She is a teacher of 8 courses at Sofia University, all disciplines being in the area of the call. Her average teaching load for the past years is 540 hours/year.

Dr. Gencheva-Kisyovska presents the following achievements to fulfill the minimum national criteria and the additional requirements of SU, FCP for occupying the Professor position:

- indicators group A - defended PhD thesis - 50 points out of minimum required 50;
- indicators group C – 4 publications in Q1 standing for a habilitation thesis, devoted to

study of structure and properties of bioactive coordination compounds - 100 points out of minimum required 100;

- indicators group D - 15 publications not included in the habilitation thesis, 2 of which in Q1 journals, 4 - in Q2, 2 - in Q2 and 7 - in Q2 (6 with IF and 1 with SJR), and 1 patent - 267 points out of minimum required 220;

- indicators group E - 64 citations (at the time of submission of the application) of the publications submitted for evaluation - 128 points out of minimum required 120;

- indicators group F – supervision of 2 PhD students, coordination of 2 and participation in 1 national and 1 international project (with secured third-party funding), co-authorship of 2 textbooks – 245.6 points out of minimum required 150;

- indicators group G – h-index 9, 1 book chapter and 1 publication in a Q4 journal not included in the previous groups, coordination of 4 university projects – 292 points out of minimum required 120.

It is evident from the above summary that the applicant either fulfills or goes beyond the minimum national requirements in all groups of indicators. The overall scientific metrics is in compliance with the general requirements of LPAB, the statutes for its application, and the additional recommendations of SU, FCP.

The research of Dr. Gencheva-Kisyovska is focused on application of a wide range of spectroscopic methods for in-depth elucidation of the complex-forming ability and molecular structure of various coordination compounds and materials based thereon. The process of complex formation of Pt(III), Pd(III) and Au(II) with hematoporphyrin (Hp) (papers 1, 3, 4, 6, 10, 11, 16) is analyzed in detail, thereby clarifying the mechanism of formation of the complexes and their structure. The effect of the ratio M:L is traced, as well as that of different factors of the medium, e.g. pH, physical state, etc. Another addressed complex with potential bioactivity is that of Pt(IV) with 1,3,5-triamino-1,3,5-trideoxy-cis-inositol (taci) (papers 20, 21). Careful tuning of the reaction conditions allows two types of complexes with different structure, one of them featuring non-standard tridentate coordination of the ligand. IR bands and other spectral fingerprints characteristic of the complex formation are identified. The structures of the possible complexes are determined and hydrolysis processes in aqueous solution and the influence of various factors thereon are studied. Since the investigated complexes are expected to have anticancer therapeutic activity, their cytotoxicity and its dependence on the structure of the coordination compounds is evaluated (papers 3, 6, 10, 11, 12, 16, 21). Different tests on various tumor, resistant and intact cell lines are carried out, using cisplatin as a reference drug. Promising bioactivity is established for some of the complexes of Pt(III) and Au(II) with hematoporphyrin, while those based on Pd(III) are less active. The dissimilar observed activities are explained by deciphering parts of their mechanisms of action. The complexes with taci have specific pharmacological characteristics and it is shown that they could overcome resistance channels typical of cisplatin. Out of 8 suggested new bioactive coordination compounds, 3 are singled out as most promising for inclusion into drug formulations: a metalloporphyrin complex of Pt(III) with Hp, a dinuclear complex of Pd(III) with Hp and a complex taci:Pt(IV)=1.

Another branch of the studies of Dr. Gencheva-Kisyovska targets elucidation of the structure and properties of new ligands capable of complex formation (papers 2, 8, 15). A series of tertiary phosphinoxides, containing either a primary or a secondary amine group, is addressed.

By forming Pd(II) or Cu(II) complexes with the ligands, their donating groups and key spectral features are identified. A phosphine oxide-type ligand is characterized experimentally and computationally. A smart application of elements of the NBO analysis enables determination of the potency of the various donating atoms for complex formation.

A third direction of the work of the applicant is related to the study of new complexes as model systems for better understanding of some biological processes (papers 4, 5, 9). Complexes of Hp with Cu(II), Fe(II) and Fe(III) are investigated as models of the interaction with lipid membranes. The change in the structure of the complexes upon redox reactions or hydrolysis is spectroscopically monitored.

The last group of works is devoted to application of vibrational spectroscopy methods for characterization of new materials or natural products (papers 7, 13, 14, 18, 19). FTIR and Raman spectroscopy are used to identify: O-centers in graphene oxide nanoparticles, amide covalent bonding with functionalizing PEG, as well as defects and degree of disorder of the nanoparticles. The contribution within the rest of the works is structural characterization of various materials.

The applicant has contributed significantly to the elucidation of the structure and properties of the studied materials. All works impress positively with the care to detail and the drive to in-depth understanding of the structure and characteristics of the studied systems. Moreover, a comprehensive toolbox of complementary techniques (mostly spectral but also computational when needed for a more thorough picture) is employed to obtain full description of the target properties. Incorporating theoretical predictions into the experimental studies is an advantage. The research is carried out at high level of expertise, also in collaboration of the applicant with colleagues from other research groups.

The habilitation thesis and summary clearly highlight the scientific findings of the applicant, which are undoubtedly substantial, demonstrating maturity and independence. The latter is verified by the fact that Dr. Gencheva-Kisyovska is the corresponding author in 11 of the publications.

Overall, the applicant has specialized very profoundly in the area of the call and I am convinced that she has the required scientific competence to continue advancing in the research areas outlined above.

In summary, the materials submitted for the evaluation comply with all requirements of the law and with the additional recommendations of SU, FCP for a Professor position. This motivates me to assess positively the applicant Associate Professor Dr. Galina Gencheva-Kisyovska and to recommend her appointment as a Professor.

April 17, 2024

Member of the scientific jury:

/ Prof. Dr. Anela Ivanova /