

REVIEW

on the application for **Professor** position in Chemical Sciences (Physical chemistry)
at Sofia University "St. Kliment Ohridski", Faculty of Chemistry and Pharmacy
announced in the Bulgarian State Newspaper, vol 21 from March 15, 2022

by Assoc. Prof. Dr. Stanimir Stoyanov Stoyanov,
Sofia University "St. Kliment Ohridski", Faculty of Chemistry and Pharmacy,
member of the scientific jury appointed with Order 38-174/01.02.2022 of the Rector of
Sofia University

Only one candidate participated in the announced competition - Assoc. Prof. Dr. Veselin Kostadinov Petrov from the Department of Physical Chemistry, Faculty of Chemistry and Pharmacy at Sofia University. The set of documents provided by the applicant meets all the requirements of the Law for the Development of the Academic Staff (LDAS) in the Republic of Bulgaria and the relevant Regulations for its implementation (including those of Sofia University and FCP). Information on additional indicators related to the selection procedure is also available.

Biographical reference

Associate Professor Veselin Petrov graduated with a master's degree in Inorganic and Analytical Chemistry from the Faculty of Chemistry at Sofia University "St. Kliment Ohridski" in 1996. After a short stay in the Laboratory of Vibration Spectroscopy at IOCCP-BAS, in 2000 he became a full-time doctoral student at the University of Forestry, Sofia. During his doctoral studies, he specialized in a Marie Curie program at the Free University of Amsterdam, the Netherlands. Since 2006 he has been a Doctor of Ecology and Ecosystem Protection (analytical chemistry and ecometrics), after successfully defending a dissertation on "Modern methods for analysis of tautomeric and dimerization processes".

Veselin Petrov continued his research and teaching carrier at the New University of Lisbon, Portugal, where he has been a Senior Researcher (2006-2014). At the end of this period, he returned to Sofia University "St. Kliment Ohridski" as a Guest Researcher in the framework of Beyond Everest project. Since 2015 he has been appointed as a Chief Assistant, and since the

beginning of 2018 as an Associate Professor, in the Department of Physical Chemistry at the Faculty of Chemistry and Pharmacy at Sofia University.

It should be noted the accumulated professional experience of the candidate from his work in companies, with a subject of activity directly related to chemistry and processing of scientific results. Personally, I think that knowing how to work in private business is a big plus for a university lecturer who is expected to train staff capable of meeting the expectations of such employers. Several applied projects devoted to the development of improved optical media and recording systems have been implemented with his participation.

Just for the last few years since his appointment at Sofia University, Assoc. Prof. Petrov has participated as a member of the team in two national projects funded by NSF, two projects under the Ministry of Science and Education Operational Programs, and in two international projects funded by European Commission programs. He is currently the Head of the Bulgarian side of an international project on "Marie Curie Actions" for Rheology of nano emulsions.

The listed biographical data shows that Assoc. Prof. Petrov has gained rich professional and scientific experience, entirely related to the announced competition.

Scientometric data

Assoc. Prof. Petrov is a co-author of 43 scientific publications, of which 41 in specialized international journals with impact factor, indexed in Scopus database. He also co-authored 2 correcting papers of his own publications, which are also indexed in Scopus. He has submitted for the selection procedure a list of 23 publications, 2 of which I did not take into consideration because they are the above-mentioned corrections (papers 31 and 37). Hence, in line with Art. 29, Sec. 1. P. 3 and 4 of the LDAS, 21 were used for my evaluation of the scientific contributions of the candidate. In 8 of those Dr. Petrov is the first or the corresponding author. Most of the publications are in very renowned and widely acknowledged peer-reviewed journals: Photochemical and Photobiological Sciences (IF=3.98, 3 papers), Journal of Physical Chemistry A и B (IF=3.18, 6 papers), Phytochemistry (IF=3.21, 1 paper), Dyes and Pigments (IF=3.47, 2 papers), Physical Chemistry Chemical Physics (IF=4.04, 1 paper), Journal of Luminescence (IF=3.59, 1 paper), Spectrochimica Acta part A (IF=3.96, 1 paper) and ACS Omega (IF=3.51, 1 paper). The publications considered for assessment have been cited 381 times in international peer-

reviewed journals, 185 of which in the last five years. The total number of citations (excluding self-citations) of the candidate in Scopus is 765, with H-index 13

The analysis of the Dr. Petrov's scientometric output clearly shows that he meets (and in many cases significantly exceeds) the minimum national requirements for the academic position "Professor" under LDAS Art. 2b and 29, for scientific field 4. Natural sciences, mathematics and informatics, professional field 4.2. Chemical sciences, as well as the recommended criteria of Faculty of chemistry and pharmacy.

Scientific contributions

The results from Assoc. Prof. Petrov's research in the 2010-2022 period have been published in a total of 27 papers with over 250 citations in the last 5 years. His main contributions can be formally divided into three main directions:

1. Preparation and investigation of the properties of new synthetic flavylum salts (19 papers)

This is the main research field in which Assoc. Prof. Petrov has worked since the beginning of his stay in Portugal and after his return to Bulgaria. Most of the publications on this topic in the world scientific literature in the last 10 years are with the participation of the candidate or his associates from the group of Prof. Pina in Lisbon. The equilibria between the different forms under which flavylum salts can exist in solution have been studied, and important relationships in their kinetic and thermodynamic behaviour in the chain of reactions have been established. The interdisciplinarity in the conducted research is impressive. It includes synthesis and characterization of new compounds, expanding the typical chain of reactions, as well as preparation of analogues of natural anthocyanins with photochromic properties. A wide variety of spectral methods have been used to study the systems, and important analytical and physicochemical parameters have been determined from the obtained data. The aggregation processes of the target compounds and how they affect their properties were also studied. On this basis, a detailed algorithm for studying this class of compounds is obtained and analytical equations are derived for the exact determination of all equilibrium and kinetic constants of the reactions.

As part of the documents for the competition, Assoc. Prof. Petrov has submitted a habilitation thesis on "Molecular metamorphoses" (44 pages), which summarizes most of the data

obtained in his studies of flavyliums and anthocyanins, as representatives of systems with molecular metamorphosis. The thesis is written clearly and concisely and highlights the most important achievements of the author in this direction. Along with other publications of the candidate, three of the articles in the competition, in which Assoc. Prof. Petrov is the first author, occupy a central place in it. Although not published as a monograph, something I would recommend in the future, it systematizes in Bulgarian the most important discoveries of Assoc. Prof. Petrov and his collaborators in the field of photochemistry and photophysics of flavyliums, which will undoubtedly facilitate and encourage the inclusion of young fellow researchers in this research direction.

2. Preparation and study of physicochemical and spectral properties of inclusion complexes in cyclodextrins and cucurbiturils (5 papers)

Studying the host-guest complexes of organic molecules in cyclic compounds is a relatively new topic in the work of Assoc. Prof. Petrov, which he successfully develops in Bulgaria, in collaboration with colleagues from Sofia University. Different approaches were tested to fine-tune certain guest characteristics in order to expand the possible applications of these molecules. For example, changes in the properties of model and natural flavyliums in the presence of cyclodextrin and cucurbituril were studied, and an improvement in the solubility and photochromic properties of the systems was found. Inclusion complexes of two non-steroidal anti-inflammatory drugs (ibuprofen and naproxen) in cyclodextrins have also been studied, and a new method for their preparation has been developed.

3. Preparation and characterization of rare earth complexes (3 papers)

This is the newest direction in the scientific research of the candidate, developed entirely in cooperation with colleagues from FCP at Sofia University and BAS, after the appointment of Veselin Petrov in the Department of Physical Chemistry. New complexes of phenanthroline with rare earth elements (Eu and Ho) in solution or hydrophobic silicon aerogel matrix are prepared and characterized. Thus, new functional materials exhibiting blue and red fluorescence were obtained, and a new model describing the broadening of the observed spectral bands was developed. The structure of $\text{LiMn}_{2-y}\text{Ti}_y\text{O}_4$ spinels was also theoretically analysed, based on published X-ray and neutron diffraction data. On this basis, the absence of tetracoordinated titanium has been proven, rebutting a widely used model for interpreting experimental data for such compounds.

Teaching activity

The regular teaching activity of the candidate is extremely rich and varied. After the appointment of Assoc. Prof. Petrov at Sofia University, he developed and leads lecture courses in various bachelor's and master's programs at FCP: Data Processing Programming and New Information Technologies I and II, Non-equilibrium Thermodynamics, Infrared Spectroscopy in the Near Infrared, Chemical Informatics, Information Technologies, including lectures in English in the course Physical Chemistry and Colloidal Chemistry (I and II) for Pharmacy in English for Foreign Students. He conducts seminars and practicum in Physical Chemistry I and II, as well as in most of the courses in which he is a lecturer. The average teaching load of the candidate in the last 5 years is 412 academic hours per year.

We can also mention the lectures and workshops that Veselin Petrov gave at the New University of Lisbon and Code Academy. The candidate has not been officially a supervisor of doctoral students but has participated as a consultant in the development and defence of 4 doctoral dissertations in Portugal and one in Bulgaria.

Based on the described teaching activities, as well as personal impressions and feedback from colleagues and students, I am not afraid to say that Assoc. Prof. Petrov has proven himself as an established and respected lecturer at the Faculty of Chemistry and Pharmacy. He has a high reputation and undoubtedly has an excellent prospect to develop independent research direction in the field of the announced competition and to build his own group, for which I am convinced that he is fully prepared.

Conclusion

The publications and habilitation thesis presented by the candidate are on the topic of the competition and represent original scientific works with significant contribution in the field of Physical Chemistry and mathematical modelling of the kinetic and thermodynamic properties. Assoc. Prof. Petrov demonstrates excellent skills in modern theoretical and experimental methods, which allows him to successfully study complex molecular systems at a high scientific level. The candidate works successfully within the Department of Physical Chemistry, and FCP in general, successfully developing new, while maintaining long-lasting collaborations with scientists from other research institutions in Bulgaria and abroad.

In conclusion, because of the above, I believe that the research and teaching activities of Assoc. Prof. Dr. Veselin Kostadinov Petrov fully meets all the requirements of the Law for the academic position "Professor". The materials submitted in the competition are in accordance with the Law on the Administration of Chemicals and Pharmaceuticals, the Regulations for its implementation and the additional requirements of the Faculty of Chemistry and Pharmacy of Sofia University "St. Kliment Ohridski". This motivates me to give a positive assessment of his candidacy and to vote "YES" on his appointment to this position.

June 28, 2022

Reviewer:

/Assoc. Prof. Dr. Stanimir Stoyanov/