

REVIEW

of the competition for the academic position "Associate Professor"
in the professional field 4.2. Chemical sciences (Inorganic chemistry),
announced in the State Gazette **no. 21/15.03.2022** by Sofia University "St. Kliment Ohridski"
for the Faculty of Chemistry and Pharmacy

Reviewer: Associate professor Dr. Albena Bavhvarova-Nedelcheva from the Institute of General and Inorganic Chemistry of the Bulgarian Academy of Sciences (with an appointment order РД 38-175/ 01.04.2022)

At the announced competition SG, iss. 21 of 15.03.2022 for the academic position "Associate Professor" has submitted the necessary documents only candidate Assistant professor Dr. Nina Kaneva - Dobrevska from the Department of Inorganic Chemistry at the Faculty of Chemistry and Pharmacy (FChPh) at Sofia University. All submitted materials are in accordance with the Act on Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for the application of the ADASRB, the Regulations for the terms and conditions for acquiring academic degrees and occupying academic positions at the Sofia University "St. Kliment Ohridski" and the Recommendations on the criteria for acquiring scientific degrees and occupying academic positions at the Sofia University for the professional field "Chemical Sciences", related to the procedure for occupying the academic position "Associate Professor".

1. Brief biography of the applicant

Chief Assistant Dr. Nina Kaneva - Dobrevska was born in 1988. In 2011 he graduated from the Faculty of Chemistry and Pharmacy (FChPh) at Sofia University as a bachelor in Computer Chemistry, and since 2012 he has a Master's degree in chemistry - Medical Chemistry. In 2016 he defended his doctoral dissertation in inorganic chemistry at FHF-SU on "Synthesis and characterization of pure and modified nanosized ZnO for photocatalytic applications" with supervisors Assoc. Prof. Dr. Karolina Papazova and Dr. Asya Bozhinova. Since 2015 he has been an assistant in the Department of General and Inorganic Chemistry, Faculty of Chemistry and Pharmacy, and since 2016 he has been a senior assistant at the same Department. In the period 2008 - 2011 Chief Assistant Nina Kaneva - Dobrevska was on several specializations abroad: 2008 - 1 week in the Department of Inorganic Chemistry at the University of Prague; 2009 - 1 month at the University of Saitama, and in 2011 for 1 week at the University of Bar-Ilan in Israel. In 2011 and 2012, Nina Kaneva participated in two international seminars at Michigan State University. The scientific interests of Nina Kaneva - Dobrevska are in the field of materials science, photocatalysis and inorganic synthesis.

2. Description of the submitted documents

Chief Assistant Dr. Nina Kaneva has attached a list of scientific papers for her entire creative period, a list and copies of scientific papers with which she participates in this competition, as well as a habilitation thesis. In the period 2009 - 2021 the candidate is a co-author of a total of 67 scientific papers and 7 chapters of books on which, according to the candidate, 617 independent citations have been noticed. She participated in the competition for "Associate professor" with one chapter entitled "*Photocatalytic efficiency of zinc oxide films obtained at different annealing temperatures*" (2020) and 18 publications, divided into quartiles as follows: Q1 - 4 issues (N 1, 7, 8, 9), Q2 - 9 papers (N 2, 3, 4, 10, 11, 12, 13, 14,18), Q3 - 2 papers (N 15, 17), Q4 - 3 papers (5, 6, 18). Regarding the authorship, it is impressive that in 14 out of 19 works presented for the competition Nina Kaneva is in first place, and in two works - in second place, which shows that her personal contribution to the production of publications is significant. All publications submitted for the competition were published in the period 2009-2020 and are the result of 9 years of research work of the candidate, among which stand out *J. Alloys Compd* - 2.134/2010, *Surface and Coating Technology* - 1.867/2012, *Applied Surface Science* – 4.439/2017. From these 19 works, the first six of the list are included in group B (indicator 4 - Habilitation work), as 1 of them is published in journals with Q1, 3 of them in Q2 and 2 in Q4, and the rest are in group Indicators D (outside the habilitation work). In the documents it was done that on the publications for the competition are indicated 35 citations (Scopus) (indicator 4) and 142 citations (Scopus) on the other publications in the indicator 7. According to the international database SCOPUS, at the time of preparation of the documents for participation in this competition, the total number of citations of publications in the period 2016 - 2021 is 332 (excluding auto-citations of all authors), and the H-index of the candidate is 12. The list of citations in the competition shows that paper number 7 of it has the widest response in the literature and 47 citations are presented for it. It is noteworthy that the intensive research of Dr. Kaneva is accompanied by participation in many projects (10), of which 8 are included in the competition. In most of them, which are funded by the National Science Fund, she was a member of the research team, and in one of them ("Photocatalytic activity of thin layers with selectively fixed fotocatalizers", KP-06-H59/11) is a leader of FChPh-SU. According to the presented reference Chief Assistant Professor Kaneva has participated in more than 90 international and national scientific forums, such as oral presentations or poster presentations, but the list does not include information about the forum (name, venue, year).

Dr. Nina Kaneva presented data on her employment (for 4 academic years, 2017/2018, 2018/2019, 2019/2020 and 2021/2022), which also includes information on the guidance of students.

All submitted materials are on the topic of the competition. A reference for the implementation of the Minimum National Requirements and the Recommended Criteria of Sofia

University for holding the academic position "Associate Professor" in the scientific field "Natural Sciences, Mathematics and Informatics", professional field "4.2. Chemical sciences is attached. The distribution by indicators is as follows: indicator A - 50 points; indicator B - 104 points (recommended 100); indicator D - 249 points (recommended 220); indicator D - 94 points (recommended 70) and indicator G - 165 points (recommended 70). It can be seen that the scientometric data of Ch. Assistant Professor Dr. Nina Kaneva-Dobrevska satisfy the requirements. I found no plagiarism in the applicant's work submitted to me for review.

3. Habilitation work and personal contribution of the candidate

Nina Kaneva's publications on the competition include research on the synthesis of thin films ZnO and its photocatalytic properties for the degradation of organic dyes Malachite Green and Brilliant Green, as well as pharmaceutical drugs - Paracetamol and Chloramphenicol. The presented habilitation work is with the unifying title "Purification of water from organic pollutants by heterogeneous photocatalysis", and this topic is undoubtedly relevant and important for research, given the priorities of the European Union and globally in areas such as ecology, human health and biodiversity. In the habilitation work, based on a literature review and own research, are summarized some of the results of the candidate's research on various sol-gel techniques for obtaining ZnO nanostructured films, and also outlines the future prospects for the development of this topic. The candidate has conducted a wide range of experiments to obtain thin films of ZnO, applying the possibilities of the sol-gel method and varying the precursors in the synthesis itself. Products of different morphology and properties were obtained by comparing the photocatalytic tests of the films obtained by different methods. ZnO nanowires were also obtained by chemical deposition, on which the morphology, size of the crystallites and their photocatalytic properties were studied. Zinc oxide (ZnO) nanostructured powders were also obtained by mechanochemical activation and their possibility for the mineralization of Paracetamol, Chloramphenicol and Brilliant Green was studied. In order to maximize the optimization of the production conditions, the effect of the solvent, the substrate and the temperature for the preparation of sol-gel ZnO thin films were studied. In addition, the effects of annealing temperature and different media (air, methanol and ethanol) for ZnO activation were also considered for the production of powders. From the results presented on the photocatalytic studies for the degradation of dyes and pharmaceuticals, it is clear that the degradation kinetics depend on the morphology, the method of obtaining the material, the specific surface, and the size of the crystallites. The publications included in indicator 7 (outside the habilitation work) also concern studies on photocatalytic properties, but it is noteworthy that most of them focus on the study of the influence of various additives on the photocatalytic properties of the obtained ZnO films and powders.

For example, papers NN 9, 11, 15 are related to the candidate's interests in studying the influence of copper, zinc ferrite and polymer additives on the photocatalytic properties of ZnO

films and powders. Some of these publications were conducted jointly with colleagues from the Institute of General and Inorganic Chemistry, the Institute of Catalysis of the Bulgarian Academy of Sciences, etc., which confirms the candidate's ability to work in a team. It is noteworthy that work number 9 is co-authored with colleagues from scientific organizations in Russia.

Nina Kaneva's participation in all publications is mainly in the study of photochemical properties, as well as in the field of synthesis and phase and structural characterization of materials, which gives me reason to conclude that the personal contribution of the candidate in these studies is significant. It makes a good impression that in her habilitation work Dr. Kaneva has also outlined guidelines for her future development, which is primarily related to the discovery of new materials for photocatalytic water treatment. My recommendation to her is to do a review work in which to compare and summarize all the results obtained so far, which I believe will find a wide response in the literature, as well as will have an even more favorable effect on its further scientific growth.

4. Scientific contributions

The main scientific contributions to Nina Kaneva's publications for the contest could be summarized as follows:

- By applying different methods, pure and doped ZnO films and powders have been synthesized, and it has been found that the sol-gel method is the best for obtaining effective catalysts. The optimal temperatures for obtaining such catalysts have also been established.
- It has been proven that in obtaining films on glass and aluminum foil, applying the immersion substrate method, the influence of the surface of the substrate on the structural and photocatalytic properties of ZnO is determined. The better morphology for obtaining efficient photocatalysts was also established.
- Nanostructured films were synthesized and characterized, for which photocatalytic reactions were performed under ultraviolet light irradiation, and the influence of the support on the properties of the thin films for the faster mineralization of Reactive Black 5 was established.
- Through the photocatalytic tests performed in the presence of ultraviolet and visible light, the kinetics of the reactions were investigated and the reason for the higher efficiency of the doped zinc oxide was found.
- From the photocatalytic tests and the calculated rate constants for the degradation of drugs and organic dyes, the influence of the activation of powders for the production of efficient photocatalysts has been proven. The modified films were found to possess higher efficiency compared to pure ZnO.
- It was found that doping with Ni²⁺ ions as well as with zinc ferrite does not significantly improve the photocatalytic activity of zinc oxide.

- The kinetics of the reactions, as well as the influence of microwave irradiation on the structural and photocatalytic properties of ZnO/TiO₂ nanostructures during thermal treatment in air, were investigated.
- In the preparation of nanostructured thin films containing copper and gallium, it was found that the potential difference at a certain temperature strongly depends on the composition and structure of the layers of the samples, as well as on the temperature of the air flow and the changes that occur at a certain vapor concentration compared to ethanol.
- It has been experimentally proven that the modification of ZnO powders with rare earth elements has a positive effect on its photocatalytic activity for the decomposition of Paracetamol and Chloramphenicol in aqueous solution in the presence of ultraviolet light. It has been experimentally proven that Ln-ZnO powders achieve faster degradation compared to those modified with Eu and Ce.

From the review of the publications and the studies included in them, one gets the impression that Dr. Kaneva has delved deeply into the research done, skillfully selected and applied a wide range of experimental techniques, with which she convincingly revealed the connection between the synthesis and the properties of the obtained materials and their practical applications. In the course of the research conducted, she has gained valuable experience for her future research. In addition, her scientific work has brought her several awards, including the "Certificate for excellence in the field of science and successful presentation of the University of St. Kliment Ohridski" in international events (Alma Mater Annual Awards)", Winner of the "Evrika" foundation scholarship for a young scientist named after Rostislav Kaishev - Department of Chemistry, Winner of the honorary award named after Prof. Dr. Yanko Dimitriev (UCTM, Department "Technology of silicates") for scientific achievements of doctoral students and young scientists in the field of materials science, chemical technologies and nanocomposite materials, etc.

5. Critical remarks

I have no critical remarks to the research from the publications of Ch. Assistant Professor Dr. Nina Kaneva - Dobrevska.

6. Personal impressions of the candidate

I have personal impressions of the candidate and they are based on our joint participation in a project on "Synthesis of nanostructured ZnO for photocatalytic applications" at the National Scientific Fund in the period 2007-2011, led by my teacher the late Prof. Yanko Dimitriev. Even then, Dr. Kaneva excelled with extreme perseverance and perseverance in solving scientific problems. Undoubtedly, her work with Assoc. Prof. Dr. Tzeco Dushkin, from whom she has gained valuable experience, and it has played a positive role in the thematic orientation of her research, and I am convinced that she has a successful career ahead of her. I believe that in the future she

will be able to attract many students to research programs, in addition she is accepting foreign opinions and is ready for professional cooperation with teams from various scientific organizations.

7. CONCLUSION

Chief Assistant Dr. Nina Kaneva - Dobrevska participates in the competition with a sufficient number of scientific papers published after the defense of Doctor's degree. The results achieved by the candidate in the research activity fully comply with the Law on Research and Development and the specific requirements of FChPh - Sofia University for its application. Dr. Kaneva is a productive and enthusiastic young researcher in the field of Inorganic Chemistry, which successfully combines academic and teaching activities. Her extensive experimental experience has led to the accumulation of a significant number of scientific results in the field of Inorganic Chemistry, Heterogeneous Photocalysis for Purification of Dyes and Pharmaceuticals, as well as methods for the production of nanostructured ZnO.

After the analysis of the materials presented in the competition, I confidently give my positive assessment of the selection of Dr. Nina Kaneva - Dobrevska for the academic position of "Associate Professor" at FChPh - Sofia University in Professional field 4.2. "Chemical Sciences", scientific specialty "Inorganic Chemistry".

Sofia,

06.07.2022

Reviewer:

(Assoc. prof. Dr. Albena Bachvarova-Nedelcheva, IGIC-BAS)