R E V I E W

by Prof. DSc Christo B. Tsvetanov, Full Member of the Bulgarian Academy of Sciences

Concerning: Competition in the field of Chemical Sciences (Polymers and polymeric materials), published in the State Gazette, issue 65, August 12 2022 with only one candidate participation Chief Assistant Professor Dr. Radostina Genova Kalinova.

Only one candidate applied for participation in the competition for academic position of "Associate Professor" in a professional field 4.2. Chemical Sciences (polymers and polymeric materials) published in the ***State Gazette*** issue 65 from August 12th 2022: Dr. Radostina Genova Kalinova.

According to Order RD-09-148 from October 11th 2022 issued by the Director of the Institute of Polymers, Bulgarian Academy of Sciences of the Institute of Polymers (IP – BAS), based on decision of the Scientific Council of the Institute of Polymers, I have been appointed as a member of the Scientific Jury in an announced competition for holding the academic position of "Associated Professor. The present review was prepared is prepared in response to Order № RD-09-148 from October 11th 2022 issued by the Director of the IP-BAS, following the decision made by the Scientific Jury meeting that was held on October 10th 2022. The Review is in compliance with *Development of Academic Staff in the Republic of Bulgaria Act (DASRBA)*, *the Rules for the Application of the Development of Academic Staff in the Republic of Bulgaria Act*, the *Rules of BAS* and with the *Rules set at the Institute of Polymers, Bulgarian Academy of Sciences, for applying the Act aforementioned*.

In the documentation provided to me is attached an Application from Dr. Kalinova to the Director of the IP - BAS, accompanied by all the documents required for the competition (9 in number), of which in paper form (1) and in electronic form (8).

1. GENERAL CHARACTERISTICS AND BRIEF BIOGRAPHICAL DATA OF THE CANDIDATE

Chief Assistant Professor Dr. Radostina Kalinova graduated as a Master student of the Faculty of Chemistry at the Sofia University "St. Kliment Ohridski" with the degree of "Chemistry" and a qualification "Applied Chemistry and Management" in the period 1993-1998. Dr. Kalinova completed her Master's Thesis in the "Polymerization Processes" laboratory at the Institute of Polymers - BAS (IP BAS) under the supervision of Associate Professor Iliyana Berlinova.

As the head of the laboratory at that time, I was well acquainted with the assigned tasks and their implementation by the graduate. Even then, Dr. Kalinova showed a good synthetic skill, good knowledge and a great desire to work. She is distinguished by exceptional precision and accuracy in her work, conscientiousness in the performance of assigned tasks and great work ability. Her supervisor, Assoc. Prof. Berlinova, was an excellent, internationally recognized specialist in the field of controlled synthesis of polymers and copolymers, which is sufficient reason for a positive assessment of the qualifications and skills obtained by Dr. Kalinova.

After defending her thesis, Kalinova worked as a "chemist" under the guidance of Assoc. Prof. Christo Jossifov at the IP - BAS. She participated in research on "carbonyl-olefin exchange reaction" in order to obtain conjugated polymers. During this period, she acquired valuable skills and knowledge in the field of using catalytic systems, especially halides and oxo-halides of transition metals.

In the period 2009 - 2012 Dr. Kalinova specialized in the Polymer and Composite Materials Laboratory at the University of Mons, Belgium, under the guidance of the world-renowned Professor Philippe Dubois. Dubois's laboratory was leading laboratory in the field of synthesis of polymers and block copolymers of polydimethylsiloxanes, their aggregation and use as adhesive materials. Kalinova acquired the educational and scientific degree "Doctor of Philosophy" in Chemistry at the University of Mons in 2012.

The topic of her dissertation was "*Bioadhesive properties of silicone coatings: effect of functionalized di-block copolymers*", supervised by Professor Philippe Dubois, Mons, Belgium.

After the defense of the dissertation, Kalinova started working again at the Institute of Polymers - BAS in the "Polymerization Processes" laboratory in the group of Professor Ivaylo Dimitrov as an Assistant and Chief Assistant Professor (since 2014). In my opinion, the supervisor of Dr. Kalinova Professor Dimitrov is one of the most outstanding specialists in IP - BAS on the highly controlled synthesis of block copolymers for the main purpose of using them as nanocarriers. The topic on which Dr. Kalinova works is extremely modern and has an interdisciplinary character, because polymer micelles and other polymer nanocarriers are proven to be effective systems for delivering drugs for the treatment of cancer and for medical diagnosis. The research tasks that Dr. Kalinova has set for herself in the last 7 years are a **successful combination of excellent results in the controlled synthesis of polymers with the interests of the rapidly developing and promising nanomedicine or drug-delivery by nanoparticles.**

The review of the personal data, the education and scientific degree obtained, as well as the acquired skills and knowledge through specialization (Prof. Dubois) and work under the guidance of very experienced and distinguished professionals from the Institute of BAS do not leave the slightest doubt about the excellent professional experience and research skills acquired by the candidate.

2. EVALUATION OF SCIENTIFIC RESEARCH ACTIVITY

In the competition for "Associate Professor" Chief Assistant Professor Dr. Radostina Kalinova participated with 18 scientific papers. The requirement that the list of publications should not include the works with which Dr. Kalinova obtained the educational and scientific degree "PhD" was met. 17 of the publications were printed in reputable journals with an impact factor. Thematically, the publications can be divided into four groups:

The largest group of works (8 in number) has significant scientific contributions in the field of the controlled synthesis of block copolymers and the possibilities of their application in medicine (works Nos. 1 – 5, 7, 8 and 9 of the list). Papers 1 to 5 are included in the author

reference as "*group B indicators*" in the "Habilitation certificate of the candidate's scientific contributions".

It is remarkable that, unlike many scientists actively working on the problem, Dr. Kalinova and co-authors mainly synthesize biodegradable copolymers using the whole range of the most modern synthetic methods. I will mention the very suitable for polymer drug delivery carriers poly-L-aspartic acid, poly-L-lysine, poly-D,L-lactide and functionalized polycarbonate. The synthesis is followed by a suitable association to polymer nanoparticles with a narrow size distribution, accompanied by the incorporation of bioactive substances or DNA into them. Dr. Kalinova and co-authors obtain valuable nanocarriers for the purposes of modern nanomedicine. The chosen topic is very current and extremely important for this rapidly developing scientific field. **I will emphasize again that the synthesis of polymers includes all the most modern methods of controlled synthesis, including the "click reaction" method.** The best evidence of the research relevance is the fact that in 2022 the Nobel Prize in Chemistry was shared by three scientists working on "one-click chemistry" or "to simplify complex processes in organic chemistry", i.e., "click" reactions.

The research with the active participation of Dr. Kalinova was carried out in the period 2015-2022, i.e., in the last 7 years. 39 citations were found, which is a very good indicator if one take into account the fact that most works were published in the last 3 years! Cooperation was carried out with highly valued Bulgarian scientists, pharmacists and biochemists from the University of Sofia, the Faculty of Pharmacy of the Sofia Medical University and some Institutes of the Bulgarian Academy of Sciences.

The second group of studies (Works Nos. 11, 15 and 18 of the list) is designated as "New Copolymers and Study of Their Relation to Different Solvents". The group includes results of Dr. Kalinova's work at the University of Mons on the synthesis of a series of block copolymers of polydimethylsiloxane and polyacrylic acid with different block lengths, as well as the extremely interesting work No.18 on a sulfobetaine copolymer in which the polymer dissolves only in highly concentrated saline water solution, while at low salt concentrations or in pure water the polymer forms aggregates. The publication: Berlinova, I. V., Dimitrov, I. V., Kalinova, R. G., Vladimirov, N. G., *Synthesis and aqueous solution behavior of copolymers containing sulfobetaine moieties in side chains*, Polymer, 41, 3, Elsevier, 2000 is the basis of Kalinova's Master's Thesis. This is her first publication with 59 citations, which is a clear proof of excellent work and a very good start to a scientific career!

The third group of studies (papers Nos. 6,8 and 17 of the list) are labeled "Polymers and polymer films with potential applications for capacitors, photovoltaic cells and LEDs". Successful syntheses of poly-ionic liquids for a supercapacitor (No.8), of polydiphenylacetylenes with end groups of Schiff bases (No. 17) and of polymer photocells (No. 6) have been carried out.

The fourth group of publications (papers No. 12-14 and 16) are devoted to the carbonyl-olefin metathesis - works on the mechanism of the reaction developed and proposed by Professor Ivan Schopov in the early 1980s.

It is quite obvious that Chief Assistant Professor Dr. Kalinova concentrated her efforts on the first group of studies! As I have already mentioned, **the subject of the research is particularly relevant and significant, the research methods used are state-of-the-art, and the results obtained are quite interesting and original.**

The applicant's documentation lists 13 participations in scientific projects financed by the Bulgarian Scientific Research Fund (8), Centers of competence, etc. In two of the projects, the work continues. The inclusion of Dr. Kalinova in projects with contemporary themes is a very good certificate for the excellent quality of the candidate's scientific work.

The scientific activity of Chief Assistant Professor Dr. Kalinova can also be evaluated based on the data on the necessary criteria for fulfilling the *minimum national requirements for competition for the academic position of Associate Professor*. From the "Reference with the necessary criteria for the competition for Associate Professor" presented for the competition for Part 4. *Natural sciences, mathematics and informatics*, it can be seen that the candidate exceeds the required points: indicator A (dissertation work) - 50 /50/; indicator B (habilitation work) - 120 /100/; indicator C (other indexed scientific publications) 241 /220/; Indicator D (Points for citations) 280 /60/. The minimum points for the indicators are shown in parentheses. The data has been checked in the *Rules for the Application of the Development of Academic Staff in the Republic of Bulgaria Act*, the *Rules of BAS* and with the *Rules set at the Institute of Polymers, Bulgarian Academy of Sciences*.

The research conducted with the active participation of the candidate for associate professor Chief Assistant Professor Dr. Radostina Kalinova, especially in the part "Controlled synthesis of block copolymers and their associates for use as nanocarriers", **represents a serious and completely original scientific research, which is included in the field of the extremely rapidly developing interdisciplinary topic "Nanomedicine".**

3. OPINIONS, RECOMMENDATIONS AND COMMENTS

I have not noticed any errors, inaccuracies or omissions in the materials provided by the candidate. Part of my personal impressions of the candidate are already indicated in 1. GENERAL CHARACTERISTICS AND BRIEF BIOGRAPHYCAL DATA OF THE CANDIDATE. I want to emphasize the following conclusions: Dr. Kalinova is a highly qualified specialist in the field of controlled synthesis of polymers and copolymers; She received excellent professional training working under supervision of internationally proven scientists from the Institute of Polymers: Professor Ivaylo Dimitrov, Associate Professor Iliyana Berlinova and Associate Professor Christo Jossifov; Dr. Kalinova specialized in the world-known laboratory of Professor Dubois at the University of Mons, Belgium, where she defended her PhD Thesis; I am witness of her dedication to science and extremely high and moral qualities; I am convinced that Dr. Kalinova will be able to supervise younger collaborators of the Institute of Polymers due to the fact that even now she is actively helping Professor Dimitrov in his work with young staff. I would recommend actively working with undergraduates, PhD students and post-graduate students, because I am deeply convinced that they can learn a lot from Dr. Kalinova's acquired skills and experience.

4. CONCLUSION

Dr. Kalinova is a co-author of 29 publications, 18 of which are included in the competition. Most publications are printed in highly specialized scientific journals with an impact factor. 140 citations were found on her works. The scientific subject matter, the experimental skills and the used methodology are at the most modern world level. I have witnessed the candidate's hard work and willingness to take on challenges. On the basis of the scientific achievements of the candidate for the competition and the evaluation of the documents and publications presented by her, **I am fully convinced to recommend to the honorable scientific jury to choose Chief Assistant Professor Dr. Radostina Genova Kalinova for the academic position of Associate Professor in professional field 4.2. Chemical sciences (Polymers and polymeric materials) for the needs of the scientific field "Macromolecular Engineering" of the Institute of Polymers, BAS. My assessment of the candidate's presentation and qualification and readiness to take up the academic position of Associate Professor is categorically positive.** I express my positive opinion and call on the other members of the scientific jury to make such a decision. Dr. Kalinova's scientific contributions are definitely important and they have received a good international evaluation.

Sofia, December 11th 2022 Reviewer:

(DSc. Christo B. Tsvetanov, Member of BAS)