

# REPORT

on the competition for the academic position Associate Professor scientific direction 4.2.  
Chemical Sciences specialization physical chemistry at the Institute of Physical Chemistry,  
Bulgarian Academy of Sciences,

announced ДВ брой № 45 от 28.05.2021 год.

Candidate: Assistant Prof. Dr. Kamelia Pavlova Kamburova-Petkova, (IPC-BAS)

Member of the Scientific Jury: Prof. Dr. Dragomir Mladenov Tatchev (IPC-BAS)

## 1 GENERAL CHARACTERISTICS OF THE CANDIDATE'S SCIENTIFIC AND RESEARCH ACTIVITY

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Kamelia Kamburova has a total of 27 scientific publications, of which only 5 are included in her doctoral dissertation. Ten of these publications are in Q1 journals, ten in Q2 journals, and one in Q3 journals. For fulfillment of the national minimum requirements set in the Law for the Development of the Academic Staff in Bulgaria, the Regulations for its Implementation and the requirements of the Institute of Physical Chemistry "Acad. R. Kaishev" - BAS to the scientific activity of the candidates for academic position "Associate Professor", the publications are distributed so that under letter "B" the candidate has 100 points at 100 required, and under letter "Г" - 235 points at 220 required. The attached list of citations of the candidate's works contains 176 citations. A reference in Scopus to date gives 145 citations of works by Dr. Kamburova without taking into account self-citations of all co-authors. In the reference for fulfillment of the requirements, the candidate indicated only 72 points, corresponding to 36 quotations. The Hirsch index of Dr. Kamburova without taking into account self-citations is 10.

The scientific production of Dr. Kamburova-Petkova is on the topic of the competition and exceeds the minimum national requirements for holding the academic position of "Associate Professor" in the field of "Natural Sciences, Mathematics and Informatics", Department of Chemical Sciences, specified in the Academic Staff Development Act in the Republic of Bulgaria, the Regulations for its application and the Regulations for the terms and conditions for acquiring scientific degrees and holding academic positions in IPC-BAS: with a required minimum of 430 points, the candidate has 457 points..

## 2 MAIN SCIENTIFIC AND RESEARCH CONTRIBUTIONS

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The scientific activity of Dr. Kamburova-Petkova is related to the coating of particles with polymer, study of their behavior in a liquid medium and their use for applications in medicine and corrosion protection. The works are predominantly experimental.

Aggregation in a suspension of polymer coated particles depending on the charge of the polymer was studied. A number of dependences have been established, such as a decrease in the mobility of the counterions of adsorbed polymers in an electric field compared to the mobility of free ions in solution; coincidence of the relaxation frequency of the electro-optical effect of adsorbed and free strongly charged polyelectrolyte; increasing of the chain length of a weak polyelectrolyte with increasing its charge; increasing electrical polarizability and thickness of layers of highly charged polyelectrolytes adsorbed on poorly charged colloidal particles, while increasing the amount of low molecular weight salt and others. Explanations, including theoretical ones, of the observed effects are proposed, in which the phenomenon of counterion condensation plays a key role.

The main part of Dr. Kamburova-Petkova's work is devoted to the preparation of polymer coatings on particles and in particular to the preparation of multilayer coatings by sequential adsorption of oppositely charged polymers. The mechanism of growth of films of weak polyelectrolytes has been studied and

conditions have been established under which the thickness of the films and their electrical properties can be adjusted in a wide range only by changing the pH of the medium. The polymer nanocontainers thus obtained are embedded in standard zinc coatings on steel, showing an improvement in anti-corrosion properties.

The encapsulation of nanoparticles of the anti-inflammatory drug indomethacin by means of a multilayer film of pectin and chitosan has a significant applied character. The second application of particles with multilayer polymer coatings is in an unexpected area - corrosion protection. Corrosion inhibitor of steel is trapped in the polymer shells of nanoparticles of hematite or kaolinite. The shells contain a polyelectrolyte with a charge that can be released when the pH changes during the corrosion process. Another method for corrosion protection of steel has been developed, as inhibitors such as polyaniline and carbon spheres are coated with a polymer and subsequently incorporated into a zinc anti-corrosion coating.

Dr. Kamburova is the first author of all five articles presented as equivalent to a habilitation thesis, as well as 4 of the 11 articles not repeating the presented for the acquisition of educational and scientific degree "Doctor". Having in mind the team of authors, it can be concluded that the work on obtaining and characterizing the colloidal particles with polymer coatings is mostly the work of the candidate.

### 3 IMPACT OF THE CANDIDATE'S SCIENTIFIC PUBLICATIONS IN BULGARIAN AND FOREIGN LITERATURE

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The publication by the candidate of a smaller number, but of better quality articles in high-impact journals makes a good impression. Thus, Dr. Kamburova-Petkova has achieved a relatively high Hirsch index (according to Scopus) through a small number of publications. This in itself speaks for the quality of the work of Dr. Kamburova and the team to which she belongs.

Judging by the citations, the applied works on encapsulation of the drug indomethacin and the use of polymer-coated particles to improve the anticorrosive properties of zinc coatings on steel are particularly well received. The latest publication on the latest topic is from January this year and already has 5 quotes.

### 4 CRITICAL NOTES AND RECOMMENDATIONS TO THE SCIENTIFIC PAPERS OF THE CANDIDATE

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I have no critical remarks or recommendations to the candidate.

## Conclusion

The research activity of Dr. Kamburova-Petkova has contributed to the modification of nanoparticles by means of polymer shells, the characterization of these particles and their suspensions and the finding of application in various fields such as medicine and corrosion protection.

The scientific production of Dr. Kamburova-Petkova exceeds the minimum national requirements for holding the academic position of "Associate Professor" in the field of "Natural Sciences, Mathematics and Informatics", professional field 4.2. Chemical Sciences, for the scientific specialty "Physical Chemistry" for the needs of the section "Surfaces and Colloids". Based on this, I propose most convincingly to the Scientific Jury to award Ch. Assistant Professor Dr. Kamelia Kamburova-Petkova the academic position of "Associate Professor" in Physical Chemistry.

17.09.2021

Prof. Dragomir Tatch

