OPINION

concerning the competition for filling the academic position of "Professor" in the professional field 4.2. Chemical Sciences, scientific specialty "Physical Chemistry", for the needs of the Department of "Surfaces and Colloids" at the Institute of Physical Chemistry "Acad. R. Kaischew" – Bulgarian Academy of Sciences, announced in State Gazette No. 41/20.05.2025
Sole candidate: Assoc. Prof. Dr. Viktoria Milkova Nakova

Member of the Scientific Jury: Prof. Dr. Ivaylo Vladimirov Dimitrov,
Institute of Polymers – Bulgarian Academy of Sciences

General overview of the research and applied scientific activities of the candidate.

The research interests of Assoc. Prof. Viktoria Milkova Nakova are focused on the adsorption of natural polyelectrolytes onto various functional model particles in aqueous media, as well as on the investigation of the electrical properties and stability of the resulting hybrid colloid–polymer systems. She is the (co-)author of a total of 41 scientific publications, 36 of which have been published in peer-reviewed international journals, along with one book chapter. The results of her research have been presented at 81 national and international scientific forums. According to the provided reference list, Assoc. Prof. Nakova has received a total of 244 citations on her publications both in foreign and Bulgarian scientific sources.

Assoc. Prof. Nakova participates in the competition with 15 publications that are indexed and abstracted in world-renowned scientific databases, as well as with one book chapter. The documents submitted for the competition for filling the academic position of "Professor" fully comply with the requirements of Development of Academic Staff in the Republic of Bulgaria Act (DASRBA), the Regulations for its Implementation (RIDASRBA), the Requirements of the Bulgarian Academy of Sciences (BAS), as well as those defined by the Scientific Council of the Institute of Physical Chemistry "Acad. R. Kaischew" (IPC)–BAS, according to Appendix No. 1. The minimum national requirements, established by DASRBA and the internal requirements of IPC–BAS, are met as follows: **50 points** for *indicator A*, since the candidate obtained the educational and scientific degree "Doctor" (PhD) in 2006. Concerning *group of indicators B*, Assoc. Prof. Nakova has presented 5 scientific publications in Quartile 1 (Q1), one of which is in a journal with SJR ranking but without an impact factor, earning a total of **110 points**, with the minimum required being 100. It is noteworthy that in 4 of these publications, Assoc. Prof. Nakova is the sole author. Concerning *group of indicators C*, 10 scientific publications in specialized journals (3 in Q1, 6 in Q2, and 1 in Q3) and one book chapter are presented, with a total of **225 points**, (minimum required 220 points). Concerning *group of indicators D*, the candidate has chosen to participate with 61 citations reflecting part of her publications, earning **122 points** (minimum required 120 points). Concerning *group of indicators E* reflecting candidate's participation in national and international projects and attracted funding, Assoc. Prof. Nakova has accumulated **369 points**, supported by appropriate documentation, thus significantly exceeding the minimum requirements of 150 points.

Major scientific and applied scientific contributions

The scientific output submitted by Assoc. Prof. Nakova for participation in the competition is devoted to studying the relationship between the physicochemical characteristics of natural polyelectrolytes and the stability of hybrid colloidal suspensions, obtained through the deposition of polymers onto emulsion droplets and non-spherical solid colloidal particles. Further research addresses the preparation and properties of multicomponent colloidal systems, formed by the

layer-by-layer deposition of oppositely charged polyelectrolytes and carbon dots onto non-spherical particles. A significant portion of the publications submitted for the competition focuses on the preparation and characterization of functional polysaccharide-containing (nano)carriers of active substances, with potential, mainly biomedical applications. Particularly noteworthy is the undeniable personal contribution of Assoc. Prof. Nakova in the 16 publications submitted for the competition: in 14 of them she is the first and/or corresponding author, and in 5 she is the sole author.

The contributions from the research presented in Assoc. Prof. Nakova's publications are of original, scientific, and applied scientific character and can be summarized as follows:

- ***Contributions related to studying the relationship between the physicochemical characteristics of natural polyelectrolytes and the stability of hybrid colloidal suspensions, obtained by depositing the polymers onto emulsion droplets and non-spherical solid colloidal particles.*** The adsorption of chitosans with different molar masses and degrees of acetylation onto lecithin-stabilized emulsion droplets has been investigated. For the first time, by applying electrokinetic methods for analysis, the influence of the degree of acetylation on the dominant type of interactions (hydrophobic or electrostatic) between the monomer units of chitosan and the negatively charged surface of the emulsion droplets has been experimentally confirmed. The effects of charge density and the addition of divalent ions on the electrical properties and the "rigidity" of multilayer films, obtained by the deposition of chitosan and pectin onto non-spherical β-FeOOH nanoparticles, have also been studied. It has been established that the electro-optical method can provide information about the mechanical properties of multilayer films analyzing the dependence of the electro-optical effect on the strength of the applied electric field. Furthermore, relationships have been identified between the characteristics (molar mass, ratio between the monomeric units) of alginates and the electro-optical behavior of non-spherical β-FeOOH colloidal particles coated with a polymer monolayer.
- ***Contributions related to the preparation and evaluation of multicomponent colloidal systems.*** Stable multilayer composite structures were prepared through the sequential deposition of alginate, chitosan, and negatively charged carbon dots onto non-spherical β-FeOOH colloidal particles. A simplified layer-by-layer deposition procedure was applied, which does not involve centrifugation after the formation of each layer. For the first time, an electric field light scattering was used to study the electrical properties and stability of the resulting structures. It was established that the electrical properties of the polymer forming the outermost layer of the multilayer structure determine the electro-optical behavior of the coated particles.
- ***Contributions related to the preparation and characterization of functional polysaccharide-containing (nano)carriers of active substances.*** Various carriers (nanocapsules, liposomes, gels) loaded with active substances (drugs, plant extracts, corrosion inhibitors), stabilized with one or more layers of oppositely charged polysaccharides, have been developed and studied. In order to achieve targeted delivery to specific proteins, some drug carriers were further surface-modified with suitable targeting ligands (aptamers). Preliminary in vitro biological studies were also conducted, demonstrating the potential of some of the developed systems for biomedical applications in the targeted delivery of active substances.

CONCLUSION

The materials submitted for the competition, together with the evaluation of the contributions in the scientific publications of Assoc. Prof. Viktoria Milkova Nakova, demonstrate that she fully meets the requirements for filling the academic position of "Professor", as defined in the Development of Academic Staff in the Republic of Bulgaria Act, the Regulations for its Implementation, and the corresponding regulations of BAS and IPC–BAS. On this basis, *I give my* ***positive assessment*** *and recommend that the esteemed Scientific Jury propose to the*

Scientific Council of the Institute of Physical Chemistry "Acad. R. Kaischew" – BAS to elect Assoc. Prof. Viktoria Milkova Nakova to the academic position of "Professor" in the professional field 4.2 Chemical Sciences, scientific specialty "Physical Chemistry", for the needs of the Department of "Surfaces and Colloids" at the Institute of Physical Chemistry "Acad. R. Kaischew" – BAS.

Opinion prepared by:

09.09.2025

/Prof. Ivaylo Dimitrov, PhD/