STANDPOINT

on the competition for associate professor in
4.2. Chemical sciences (Biophysicochemistry)
announced in SG, issue 63 of 30.07.2021

with candidate Dr. Nikolai Alexandrov Grozev

from Prof. Dr. Tony Georgiev Spassov
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In the competition for associate professor of Biophysicochemistry at the Faculty of Chemistry and Pharmacy of Sofia University participates one candidate - Chief Assistant Professor Dr. Nikolai Alexandrov Grozev. Nikolay Grozev graduated from the Faculty of Biology at Sofia University “St. Kliment Ohridski ”- Master's degree in Molecular Biotechnology in 1998. In 2003 he defended his thesis for the educational and scientific degree Doctor of Chemistry, Department of Physical Chemistry (Laboratory of Biophysicochemistry).

Nikolay Alexandrov Grozev works in the Department of Physical Chemistry at the Faculty of Chemistry of Sofia University as an assistant (2003 - 2008), and since 2008 he has been a senior assistant.

Nikolay Grozev specialized in Unité Mixte de Recherche ‘Fractionnement des Agro-Ressources et Emballage’, INRA, Reims, France in 2000 and 2001; postdoctoral fellow at the Institut de Chimie des Surfaces et Interfaces, CNRS, Mulhouse, France (2005-2006).

The scientific activity of Ch. Assistant Professor Dr. Nikolay Grozev covers 32 publications, 28 of which are referenced and indexed in Scopus. He participated in the competition with 18 publications: 15 were in journals, two - in conference proceedings and one chapter in a series. Seven of the publications are in Q1, four in Q2 and Q3 and one in Q4. A total of 115 citations have been noticed on the works of Nikolay Grozev (h index - 6), 88 of the citations are from publications included in this competition. The candidate also presented a habilitation thesis based on 5 of his articles.

Dr. Grozev is a participant in 14 national and international projects, manager of two projects at NSF-SU. He is the head of a graduate student. He participated in 15 scientific conferences.

The teaching activity of Chief Assistant Professor Nikolay Grozev covers lectures and exercises at the Department of Physical Chemistry of the Faculty of chemistry and pharmacy.

Grozev's research work is related to the study of phenomena occurring at phase boundaries: adsorption of ions and surfactants; chemical reactions occurring at the water/air phase boundary; application of monolayer techniques for the study of drugs and drug carriers; thin films on solid substrates; foams and wetting films. Despite the diversity in terms of the objects of investigation, the works and scientific contributions of Dr. Grozev belong entirely to the field of physicochemistry of surfaces.

Below, following the structure of the report on the scientific contributions presented by the candidate, I will focus on some more significant results, which in my opinion define my colleague Grozev as a precise and thorough researcher who has mastered a number of experimental physicochemical techniques and methods and at the same time having serious theoretical /physicochemical/ training.

In a paper of the candidate, Schmutzer's model for the surface of aqueous solutions of electrolytes was extended to Z +: Z-salts, taking into account the non-ideality of the solutions and the presence of a diffuse electric layer. Another work by Grozev is devoted to the production of platinum nanoparticles by the reduction of $PtCl6^{2-}$ with hexadecylaniline, the reaction being carried out at the air-water phase boundary. A monolayer technique was also used by the candidate to compare the rheological properties of commercial drugs, using an original model system of the alveolar surface. In another work, using the monolayer approach, the behavior of drug carriers was evaluated, using model systems of vesicles, nanocapsules and biodegradable polyester matrices.

The works of the candidate dedicated to thin films deserve special attention as well. A series of publications investigated the structure of thin polymer films of di-block copolymers. The crystallization process has been studied by varying the thermodynamic driving force of the crystallization process through supercooling and concentration variation; both crystalline and amorphous phases were found after solidification of the polymer blends. Attention is also paid to crystal growth in polymer films and especially to morphological instabilities in the growth process. In addition, experiments have shown that polymer thin films are useful model systems for studying the crystallization of polymers.

Two other articles by the candidate discuss the formation of films on solid substrates containing ruthenium complexes for oxygen sensors. The sol-gel technique for film preparation has been successfully applied. A number of process parameters have been optimized in order to obtain the appropriate thickness and porosity of the films, which are crucial for the efficiency of the sensor.

The last group of Grozev's publications included in the competition examines the processes of water droplets wetting on glass surfaces with a printed network of hydrophilic cells and hydrophobic frames and developed a new theory, taking into account the contribution of the three-phase contact line to the contact angle. The effect of foam film flowing on a suspension of silver nanoclusters stabilized by polymethacrylic acid was also studied. Reduced steric repulsion between the two film surfaces was found, leading to thinner and more stable films compared to aqueous solutions of PMAA without silver nitrate.

Finally, I would like to express my opinion on the Grozev's habilitation thesis, which includes the results of 5 scientific publications. All of them have found a place in peer-reviewed scientific journals and are united thematically, examining the processes of nucleation and crystal growth in polymer systems. Appropriately, using an original methodology, the two stages of polymerization of polymers - nucleation and subsequent crystal growth - have been successfully separated. Due to the difficult formation of new nuclei in the considered polymer systems, the growth process of polymer crystals is experimentally studied separately. A

growth regime favorable for the formation of helices leading to stacked polymer lamellae is also shown. It has been suggested that this is the main mode of growth of polymer crystals in three dimensions, even in single crystals.

Experimental studies of these model systems together with the application of the theory of crystal growth lead to a deeper understanding of the mechanism of crystallization of polymers, in many cases a non-trivial research problem.

Conclusion:

Based on the above arguments, I propose Chief Assistant Professor Dr. Nikolay Alexandrov Grozev to be elected as Associate Professor of Biophysicochemistry at the Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski".

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