REVIEW

by Prof. Dr. Antonia Evgenieva Stoyanova, Institute of Electrochemistry and Energy Systems (IEES) - Bulgarian Academy of Sciences

Subject: Competition for academic positions "professor" in the professional field 4.2. (Chemical Sciences), declared from the Sofia University "St. Kliment Ohridski" for the needs of the Faculty of Chemistry and Pharmacy, SG, issue 25 of 26.03.2019.

1. Conducting the competition and basis for the review:

The competition is declared for the needs of the Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski", SG, issue 25 of 26.03.2019. The scientific jury is proposed by the Faculty Board, protocol Nr. 11 / 16.04.2019 and was approved by Rector order No. RD 38-224 of 10.05.2019.

The only participant in the competition is Dr. Stoyan Ivanov Karakashev, lecturer at the Faculty of Chemistry and Pharmacy, SU. According to the attached documents, the applicant fully complies with the formal requirements of Act for the Development of the Academic Staff in the Republic of Bulgaria, Regulations for the Application of the Act for the Development of the Academic Staff in the Republic of Bulgaria and Regulations for the terms and conditions for acquiring academic degrees and occupying academic positions of the Sofia University "St. Kliment Ohridski".

At its first meeting, held on 06.06.2019, the Scientific Jury chose Prof. Dr. Nikolay Denkov Denkov as Chairman and Prof. Dr. Nikolay Denkov Denkov, Prof. Dr. Slavka Stoyanova Cholakova and Prof. Antonia Evgenieva Stoyanova as reviewers.

According to the decision of the Scientific Jury, the reviews and opinions must be submitted until 31.07.2019 in Bulgarian and English and the final jury meeting to be held on 09.09.2019.

2. Description of the submitted documents and materials from the candidate:

2.1. Documents: curriculum vitae, diploma for higher education, diploma for educational and scientific degree "doctor", document for academic position "associate professor", certificate of work

experience in the specialty, documents proving the fulfillment of the requirements of art. 115, para. 1, item 2, medical certificate, criminal record certificate.

2.2. List of publications, inventions and other scientific-applied results, reference for implementation of national requirements for the relevant scientific field; reference to citations with full bibliographic description; information for the original scientific contributions; reference for the indicators under Art. 122, para. 2, all with the necessary evidence.

2.3. Scientific papers and abstracts of the publications in Bulgarian and English.

2.4. A copy of the announcement in the State Gazette.

2. General presentation of the candidate:

Stoyan Karakashev was born in 1970. In 1995 he graduated from the Faculty of Theoretical Chemistry and Chemical Physics at the Sofia University, and two years later also a postgraduate specialization in "Control and Water Treatment" in the laboratory of thermodynamics and physicochemical hydrodynamics at the same university. In 2002, he defended his doctoral dissertation on the subject: "Theoretical adsorption models and their application to the ionic, non-ionic and mixed surfactants on the water / air surface ". In 2010 he began work at Sofia University "St. Kl. Ohridski ", where he is currently working, and in 2013 he received the academic title of "associate professor" at the Department of Physical Chemistry at the same university. He was a guest researcher at different universities and scientific organizations, such as the University of Utah, USA (2012), Leibniz Polymer Research Institute, Dresden, Germany (2012, 2013), University of Cambridge, UK (2014), University of Illinois, Chicago, USA).

3. General description of the scientific and teaching activities of the candidate:

Scientific production and reflections of scientific publications

S. Karakashev is author of 90 scientific publications (including two book chapters). In the competition he participated with a total of 21 publications, 12 of which were in scientific journals in quartile Q1 and 6 in Q2. Of these publications in 4 the candidate is the sole author and in other 9 - the lead author. There are presented reports for participation in 12 conferences. 936 citations were spotted (according to Scopus).

The candidate has participated in 3 national projects and manages one of them. He has been the leader of three international scientific projects.

The materials submitted for review are compliant with the minimum requirements for occupying the academic position "professor" in the professional field 4.2. (Chemical Sciences), indicated in Act for the Development of the Academic Staff in the Republic of Bulgaria, Regulations for the Application of the Act for the Development of the Academic Staff in the Republic of Bulgaria and the Regulation on the terms and conditions for acquiring academic degrees and for taking academic positions at Sofia University “St. Kliment Ohridski”. In all groups of indicators, the results of Assoc. Prof. Karakashev exceed the requirements.

Teaching activity of the candidate

The teaching and pedagogical activities of the candidate include lectures on several subjects: Environment and Disperse Systems, Physical Chemistry (2 and 3 part), Physical Chemistry of Surfaces and Electrochemistry and electrochemical phenomena and also exercises in three of these disciplines. For the winter semester of 2018/2019 the lecturing and total employment of the candidate is 324.5 hours and 336.8 hours respectively, which shows an implementation of the required teaching hours. In addition, under his leadership, three diploma thesis are successfully completed.

3. Main contributions

Prof. Karakashev's scientific interests are in the field of thin foam films, adsorption layers, foam and emulsions and phenomena associated with wetting, ion specific effects on foams, etc. This thematic area is mainly developed by the candidate who has built a team and creates a modern laboratory for its successful implementation.

The contributions in the research papers of Prof. Karakashev are mainly related to the obtaining of new scientific knowledge and in my opinion the main can be summarized as follows:

- A new adsorption model of ionic surfactants has been developed with a second under-surface layer of surfactant on the water / air surface. The model successfully elucidated why sodium

dodecyl sulphate (SDS) adsorption at the oil / water interface unexpectedly decreases as the hydrophobicity of the oil phase increases.

- A procedure has been developed for the fast and accurate estimation of the equilibrium surfactant adsorption constant and a rapid assessment of their surface activity, based solely on their molecular structure. The results allow immediate estimation of the adsorption strength of nearly 300 surfactant systems, for many of which the adsorption constants are not known, mentioned are techniques to extend this method to other types of systems with surfactants. Comparisons of the calculated constants of randomly selected surfactant systems against their experimentally measured values yielded deviations of only about 3.5 ± 2%. This is a powerful tool for quantitative screening and cost-benefit analysis of surfactants for designing many industrial processes.

- Developed a method to quickly calculate the critical micelle concentration (CMC) of various surfactants considering ion-specific effects. The method is applied to a test set containing 11 anionic/cationic surfactant + salt systems and 8% accuracy was obtained from the experimentally determined CMC values.

- A definite way to determine the adsorption energy of the surfactant's hydrophilic head on the air water interface is presented. A parameter called adsorption capacity of surfactants with simple molecular structure for easy estimation of their surface activity was defined and validated. Linear dependence between the CMC of ionic surfactants and their adsorption capacity was established.

- It was first conducted in-depth a study the tribology of bubble rubbing on solid surface. With unique experimental setup, specially designed for monitoring the thickness profiles of wetting film, intercalated between the bubble and moving solid surface were determined 3D profiles of the disjoining, the lift pressures as well as the viscous stress tensor as a function of the velocity of the solid surface. The proposed technique reveals new possibilities for investigation of bubbles and solid surfaces on deeper level when they are in relative motion towards each other, as well studies on bubbles moving in close proximity to solid surfaces.

- An original interferometric study on the rubbing of ruptured bubbles on hydrophobic solid surfaces was performed. It is established an interesting phenomenon, showing that at certain critical speed of motion of the solid surface the bubble detaches from the surface. The factors, on which the critical speed depends was identified.

- A detailed review of the latest achievements on superspreading over the past 25 years has been conducted, including own research on the effects of superspreading and superspreaders in thin film films. The work could be a useful guide for professionals and non-specialists in the field of superspreading.

4. Personal impressions

I do not know the candidate and I have no personal impressions of him.

5. Critical remarks and recommendations

I have no critical remarks on the scientific works of the candidate.

CONCLUSION

The presented scientific production of the candidate in the contest Dr. Stoyan Ivanov Karakashev in volume, quality and scientific metric indicators fully meets and exceeds the requirements of the Act for the Development of the Academic Staff in the Republic of Bulgaria, Regulations for the Application of the Act for the Development of the Academic Staff in the Republic of Bulgaria and Regulations for the terms and conditions for acquiring academic degrees and occupying academic positions of the Sofia University "St. Kliment Ohridski".

The thematic orientation of the scientific work and publications of the candidate is entirely within the announced perspective. The area in which the main scientific results are achieved is up-to-date and promising. The teaching activity of the candidate is of a high level, a testimony of which is the student assessments, and exceeds the requirements of the Sofia University.

Finally, I would like to strongly recommend to the members of the Honoured Scientific Jury to vote for the award of the academic title "Professor" to Assoc. Prof. Dr. Stoyan Ivanov Karakashev in professional field 4.2 (Chemical Sciences).

22.07.2019 Reviewer:

Prof. Antonia Stoyanova, PhD