

REVIEW

by

Member of the scientific jury: Krastanka Georgieva Marinova, PhD, Associate Professor at the Faculty of Chemistry and Pharmacy, Sofia University “St. Kliment Ohridski”

Competition for academic position “Associate Professor”, Scientific direction 4.2., Chemical sciences, Speciality Physical Chemistry at the Institute of Physical Chemistry, Bulgarian Academy of Sciences, published in SG number 51/13.06.2023.

CANDIDATE: Plamen Hristov Tchoukov, PhD, Chief Assistant Professor in IPC-BAS

- 1. General characteristics of the research activity of the candidate.** The materials presented by the only candidate in the competition Chief Assist. Prof. Dr. Plamen Tchoukov meet the minimum national requirements of the Act of Development of Academic Staff of the Republic of Bulgaria and the Regulations for its implementation, as well as the Rules of the Bulgarian Academy of Sciences (BAS) and the Regulations on the terms and conditions for obtaining scientific degrees and holding academic positions in the Institute of Physical Chemistry (IPC) of BAS. Mr. Plamen Tchoukov obtained a PhD degree, speciality Physical Chemistry, in 2006 with a thesis entitled "Experimental investigations of the selforganization of amphiphilic molecules in thin foam films", and he has been a chief assistant professor at IPC-BAS since 2006. He successfully realized several postdoctoral and research positions at the University of Alberta, Canada, and in industrial companies in Canada, from 2008 to 2022.

For his participation in the competition, Dr. Tchoukov has presented six publications as the equivalent of a habilitation thesis. All six papers have been published in renowned scientific journals, 4 from the first quartile (Q1): Energy & Fuels, and Langmuir, and 2 from the second quartile (Q2): Colloids Surfaces A. Another 12 publications in renowned scientific journals (6 papers in Q1, 5 in Q2, and a patent application), published after PhD completion, are presented.

The materials presented in the application cover the minimum national requirements and those of BAS and IPC as well: group A - 50 points (min req. 50 points), group B - 140 points (min req. 100 points), group D - 265 points (min req. 220 points), group D - 2398 points declared (min req. 60 points).

- 2. Main scientific and applied scientific contributions.** The research activity of Dr. Tchoukov is in several main directions: (1) Mechanisms of stabilization of W/O petroleum emulsions and effect of different crude oil fractions; (2) Design of unique scientific instrumentation for studying thin liquid films; (3) Drainage kinetics and interactions in thin liquid films formed between a flat solid surface and approaching drop/bubble; (4) Impact of adsorption layer properties on thin liquid films behaviour. These research areas are “traditional” for the Department Interfaces and Colloids of IPC-BAS, and Dr. Tchoukov has made a very significant contribution to their modern development and successful application in non-traditional areas. The six publications presented as the equivalent of habilitation work contribute for a significant advancement and the new knowledge of the underlying mechanisms of bitumen emulsions and thin films stabilization, especially the key role of the asphaltene aggregation for the emulsion stability. These six publications, together with more than ten others on bitumen emulsions, demonstrate pretty well a very complex and consistent approach, including a development of appropriate experimental techniques and physicochemical approaches, and adequate theoretical descriptions, including molecular dynamics simulations. As a result, new mechanisms of stabilization of films and emulsions are described, and new approaches are proposed for the optimization of deemulsification in bituminous emulsions. The results of the research represent the formulation and proof of new hypotheses which significantly enrich the existing knowledge and have a direct industrial applications. Dr. Tchoukov is the first author in two of the six publications equivalent to a habilitation thesis, and is the second author in the remaining four, which undoubtedly proves his decisive contribution to these studies. They have received almost 500 citations so far, although published in the period 2010-2018, which clearly demonstrates the value and impact of research.

I would acknowledge the significant contributions in the other areas as well. Dr. Tchoukov has skillfully applied and upgraded the classical Scheludko-Exerowa cell with a substantial automation and new features, including valuable dynamic studies, and a modification allowing the addition of new components to the emulsions. The experimental investigation and description of dynamic films between bubbles and a flat surface provide direct information on the influence of the approach velocity of the bubbles on the hydrodynamic pressure in the film, and allow for the estimation of the surface mobility. The studies of the behavior of dynamic films attract much attention recently and these publications also have a noticeable number of citation.

Dr. Tchoukov has participated in quite a number of projects in Bulgaria and Canada. He has worked as a research scientist and a senior scientist in several companies, and has a reach expertise in the management and legislation of chemical products and technologies. He is a co-author of a patent application. All these activities convincingly demonstrate both high expertise and enviable entrepreneurship of the candidate.

3. **Impact of the scientific publications of the candidate in the Bulgarian and international literature.** The total number of publications of Dr. Tchoukov referred to in the Scopus database is 38 (data from October 16, 2023) and the citations (without self-citations) are 1240. 493 of the citations are on the six publications presented as the equivalent of a habilitation thesis. The numbers convincingly demonstrate the high impact and relevance of the candidate's scientific work, and the high evaluation of the international scientific community for the works of Dr. Tchoukov. Results of the scientific studies have been presented in over 65 oral and poster contributions at international conferences, incl. as keynote lectures.
4. **Critical remarks and recommendations to the scientific papers of the candidate.** I have no remarks on the submitted papers and materials. There are few insignificant technical errors in the presented documents, but the important scientific results and contributions are well presented and highlighted. I have not direct impressions of Dr. Tchoukov himself, but his scientific works and achievements, as well as their impact among the scientific community, undoubtedly show the high level of his work.

Conclusions

Based on the submitted materials for the competition, the quality of the scientific publications, their very high citation rate, and the distinguished significant contribution of Dr. Tchoukov for the modern development of important areas of the physical chemistry of colloids and surfaces, I find the application to fully correspond to the requirements of the Act of Development of Academic Staff of the Republic of Bulgaria and the Regulations for its implementation for occupying the academic position Associate Professor. I am confidently giving a POSITIVE assessment and I recommend Chief Assist. Prof. Dr. Plamen Hristov Tchoukov to be elected to the academic position of "Associate professor" at IPC-BAS, in the professional field 4.2 Chemical Sciences, Speciality "Physical chemistry".

16.10.2023
Sofia

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/Assoc. Prof. Krastanka Marinova/