

OPINION

within the call for **Professor position** in 4.2 Chemical sciences (Physical Chemistry – Formulation of dispersions for cosmetics and home care)
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by Prof. Dr. **Anela Nikolova Ivanova**
Sofia University, Faculty of Chemistry and Pharmacy,
member of the scientific jury appointed with Order № RD 38-368 from 08. 07. 2024
of the Rector of Sofia University

There is a single applicant for the position – Assoc. Prof. Dr. Krystanka Georgieva Marinova. She has been employed at Sofia University, Faculty of Chemistry and Pharmacy (SU, FCP) since 2001 and has occupied an “Associate Professor” position for the last fourteen academic years at the Department of Chemical and Pharmaceutical Engineering. In 2003, she has been awarded a PhD degree after successful defense of a thesis “Mechanisms of action and aging of rapid anti-foamers” at SU, FCP. Since 2017, she has been the coordinator of the Master program “Cosmetics and home care chemistry”. In the period 2012-2019, she has been Vice-dean of FCP for bachelor studies. All required documents are available, together with information on additional criteria related to the selection procedure.

Dr. Marinova is a co-author of 44 scientific articles, 30 of which published in international peer-reviewed journals (Source: Web of Science), of one book chapter, of one international patent and of one international patent application. She has submitted for the selection procedure 19 publications, 1 book chapter and 1 patent (13 articles and the book chapter published in international peer-reviewed journals). None of these has been used for the position of Associate Professor or for the PhD degree. Hence, in line with Art. 29, Sec. 1, P. 3, 4 of the Law for promotions in academia in Bulgaria (LPAB), they are eligible for evaluation of the scientific contributions of the applicant. The articles are published in journals specialized in the area of the study or with a more general profile. Significant share of the publications are in renowned international journals: Journal of Colloid and Interface Science (4 papers), Advances in Colloid and Interface Science (2 papers), Langmuir (1 paper), Colloids and Surfaces A (6 papers). In 4 of the articles Dr. Marinova is first author and in 7 of them – the corresponding author. This signifies her important and independent contribution to the research. The patent is international and protects equipment for surface tension measurement. The publications submitted for assessment have been cited 488 times in international peer-reviewed journals. The total number of independent citations of the publications of Dr. Marinova is >1900 (Source: Scopus). She has had 2 specializations abroad and has completed one professional training. Dr. Marinova is a member of one international educational network, 4 COST actions, one international and 2 national professional organizations. The applicant has coordinated a number of international, national and industrial research projects. Dr. Marinova has co-supervised 3 PhD students and >20 successfully defended diploma theses. She is a co-author of 42 contributions presented at scientific events. She is a teacher of many bachelor and master courses at Sofia University, all disciplines being in the area of the call.

Dr. Marinova presents the following achievements to fulfill the minimum national

criteria and the additional requirements of SU, FCP for occupying the Professor position:

- indicators group A - defended PhD thesis - 50 points out of minimum required 50;
- indicators group C – 3 publications in Q1 and 2 in Q2 standing for a habilitation thesis, devoted to new methodology and equipment for surface tension measurement - 115 points out of minimum required 100;
- indicators group D - 9 publications not included in the habilitation thesis, 6 of which in Q1 journals, 3 - in Q2, 1 book chapter, and 1 patent - 240 points out of minimum required 220;
- indicators group E - 488 citations (at the time of submission of the application) of the publications submitted for evaluation - 976 points out of minimum required 120;
- indicators group F – co-supervision of 3 PhD students, coordination of 1 international and 1 national and participation in 6 national research projects (with secured third-party funding) – 310 points out of minimum required 150;
- indicators group G – h-index 20, 6 new teaching courses, 6 publications not referenced in the international databases, coordination of 1, co-coordination of 1 and participation in 5 industrial projects, supervision of 18 and co-supervision of 7 defended diploma theses – 551 points out of minimum required 120.

It is evident from the above summary that the applicant either fulfills or goes beyond the minimum national requirements in all groups of indicators. The overall scientific metrics is in compliance with the general requirements of LPAB, the statutes for its application, and the additional recommendations of SU, FCP.

The research of Dr. Marinova is in the following areas:

- 1) Development and validation of new experimental methods for determination of interfacial tension and rheology of expansion of fluid and solidifying interfaces between fluid phases - 5 papers;
- 2) Experimental study and physical chemical description of surface properties of systems with non-standard characteristics - 4 papers
- 3) Physical chemical characterization of multi-component systems with application in cosmetics and home care - 14 papers.

Within the first area, a methodology is developed and patented and the necessary equipment constructed (papers 1, 4, 7, 9 and 21) for simultaneous evolutionary measurement and analysis of pressure and profiles of axially symmetric drops and bubbles. This allows accurate determination of the phase state of surface layers in time, of the components of the surface tension tensor, of a set of rheological parameters at the interface between low- and high-viscosity liquids. A quantitative criterion is suggested identifying the change of phase state, which is validated on layers of two surface-active proteins. The derived methodology is applied on layers adsorbed on liquid or solid surfaces. In the latter case, contact angles and adhesion forces may also be measured with high precision.

The main achievement in the second research direction is description of hitherto unknown and highly non-trivial surface adsorption and rheological properties of Quillaja saponin extracts (paper 2), of mixtures of the protein hydrophobin with the anionic surfactant SDS (paper 6) or with other proteins at the oil/water interface (paper 10). The influence of the sequence of addition of the components and of their concentration is traced. Innovative data analysis is suggested to obtain the dependence of surface elasticity on the surface

tension/pressure. Irreversible adsorption of hydrophobin at the air/water and oil/water interfaces is proven and used to produce very stable emulsions. It is demonstrated that the addition of a fatty alcohol to alkaline aqueous solutions of mixtures of low-molecular-weight surfactants (paper 11) results in lower surface tension and higher surface elasticity and viscosity expansion moduli, thereby quantifying also the effect of temperature.

The most profound work is in the third research direction. It is devoted to investigation (also kinetic) of various adsorption and rheological properties of mixed dispersions and to revealing their relation to the behavior of the mixed systems in cosmetics and home care products. The objects of study are diverse: proteins (papers 3, 8), amphoteric surfactants (paper 15), contaminants of solid surfaces (paper 13) or leather (paper 19), oil drops (paper 13), layers deposited on solid surfaces (papers 18, 20). An application-related aspect of the studies is the development of a systematic physical chemical procedure for the production of industry-ready formulations (papers 12, 13, 14, 16, 17, 19, 22).

It may be concluded that the described research is of high quality and with substantial practical impact. The direct relation to industry is also valuable. The systematic, precise approach with care to detail is impressive. The methodological advances are notable, too

The contributions submitted for assessment outline Dr. Marinova as a skillful scientist with both theoretical and diverse experimental professional competence. The intensive international and industrial collaborations are a merit. Her extremely successful supervision of students should be highlighted, too, together with the significant contribution to the development of the Faculty of Chemistry and Pharmacy during her eight-year work as a Vice-dean.

Overall, the applicant has specialized very profoundly in the area of the call and I am convinced that she has the required scientific competence to continue advancing in the research areas outlined above.

In summary, the materials submitted for the evaluation comply with all requirements of the law and with the additional recommendations of SU, FCP for a Professor position. This motivates me to assess positively the applicant Associate Professor Dr. Krystanka Marinova and to recommend her appointment as a Professor.

November 1, 2024

Member of the scientific jury:

/ Prof. Dr. Anela Ivanova /