STANDPOINT

by competition for the academic position of "Associate Professor" in the professional direction 4.2. Chemical sciences (Processes and devices in chemical and biochemical technology), for the needs of the "Engineering-Chemical Systems Engineering" laboratory at the Institute of Chemical Engineering - BAS
announced in SG no. 96 of 02.12.2022
with candidate Ch. Assist. Prof. Dr. Petya Georgieva Popova-Krumova
The standpoint was prepared by: Prof. Dr. Eng. Kosta Petrov Boshnakov

1.General characteristics of the candidate's scientific-research and scientific-applied activities. The scientific research work of Ch. Assist. Prof. Dr. Petya Popova-Krumova is related to theoretical and experimental research, mathematical modeling and optimization of processes taking place in packed bed absorption apparatus, column chemical reactors and distillation columns.

Dr. Petya Popova-Krumova has participated in two projects financed by the Scientific Research Fund of Bulgaria, in four projects in line with the inter-academic cooperation between the Bulgarian Academy of Sciences and universities in Israel, in one project financed by the "Operational Program Development of Human Resources 2007-2013" of the European Union and one on bilateral cooperation Russia-Bulgaria. Dr. Petya Popova-Krumova led one project financed by the Scientific Research Fund of the Ministry of Education and Science, the "Young Scientists - 2011" competition and one project financed only by the budget subsidy of the Bulgarian Academy of Sciences.

The applicant has participated in two useful models: Column apparatus for intensive mass transfer in three-phase systems and Column reactor for conducting chemical processes and three patents: Method and apparatus for absorption of gases, Apparatus and method for purification of gases from sulfur dioxide and Apparatus for absorption of medium and highly soluble gases. Utility models and patents are protected by documents issued under the proper order.

Dr. Petya Popova-Krumova was awarded a Gold Medal for the presentation of the developments "Absorption-adsorption apparatus and method for purifying gases from sulfur dioxide", X national exhibition "Inventions, Transfer, Innovations" - ITI'2017.

2.Basic scientific and scientific-applied contributions. For participation in the competition, 18 scientific papers were submitted, of which, according to the List of Publications, monographs were published with the numbers 6 and 8 by a group of authors with the participation of Dr. Petya Popova-Krumova.

As a habilitation thesis, eight scientific publications are presented in publications that are referenced and indexed in world-renowned databases with scientific information. Papers are numbered 4, 5, 11, 12, 14, 15, 16 and 17 according to the list of publications. Of these, one with number 15 is in quartile Q1, one with number 12 is in quartile Q2, four with numbers 4, 5, 11, 14 are in quartile Q4 and two with numbers 16, 17 are in conference proceedings with SJR.

The scientific works, submitted for participation in the competition contain the following more important scientific, scientific-applied and applied contributions:

1.For the gas-liquid countercurrent packed absorption column, an approach is proposed to estimate the thickness of the liquid layer and its surface velocity along the height of the wall.

2.For an industrial distillation column, the efficiency of separation of the mixture, the dynamics of formation of non-uniform temperature field along the column cross-section and the distribution of local liquid flow velocities of the output of the package.

3.An approach for modeling, with convective-type models, of industrial absorption processes in co-current absorption columns for highly and poorly soluble gases is presented. The model parameters related to the radial velocity non-uniformity in the gas and liquid phases are obtained.

4.A theoretical analysis of the processes for purification of gases with a low SO_2 content in thermal power plants has been made. A new approach for qualitative analysis (convective-diffusion model) and quantitative description (average concentration model) of absorption processes in column apparatus is proposed.

5.For the SO_2 waste gas purification process, which is realized in a three-zone absorption column with a two-phase absorbent ($CaCO_3/H_2O$), a mathematical model is presented and an algorithm for its solution is proposed.

6.For qualitative analysis of SO_2 gas purification processes in countercurrent absorption apparatus and identification of the mechanism of the process, the convective-diffusion model was used, and the average concentration model was presented for quantitative analysis.

7.A mathematical model based on average concentration is applied for the quantitative description of physical and chemical absorption in column apparatus. Methods for solving the model and identifying its parameters are proposed

8.A theoretical analysis of the simultaneous processes of mass and heat transfer in column reactors is made and mathematical models describing them are presented. The effect of the radial non-uniformity of the gas velocity distribution is theoretically investigated and mathematical models based on average values of the gas velocity and temperature are proposed.

9.A theoretical analysis of the process of removing SO_2 from the waste gases of the thermal power plants using a two-phase adsorbent ($CaCO_3/H_2O$) was made, the conclusion of which is that in practice the process is physical absorption.

10.A kinetic model of the biotransformation process of glycerol by Klebsiella oxytoca is presented and a hierarchical approach for the estimation of its parameters is proposed.

11.For tuning some of the considered mathematical models a hierarchical approach to parameter estimation in the mathematical model is proposed and applied, where a polynomial approximation of the experimental data is used, and the obtained parameter estimates are used as initial conditions for the next step in the estimation procedure.

12. A theoretical analysis of the absorption of SO_2 with alkaline absorbents in packed columns in the case of one- and two-phase absorbents was made. A diffusion type model and a mean concentration model are used for gas absorption in column apparatus.

3.Reflection of the candidate's scientific publications in Bulgarian and foreign literature. In the documents for participation in the competition, a list of 41 citations of scientific works is

presented, with the participation of Dr. Petya Popova-Krumova. There are 32 citations that meet the requirement that the citations be in scientific publications, referenced and indexed in world-renowned databases with scientific information, or in monographs and collective volumes.

for participation in the competition, I noticed the following omissions: (1) There is a discrepancy in the numbering of scientific works in the files with names Abstract_Articles and Spisuk_Publikacii; (2) The titles of publications numbered 7 and 8 in the Abstract_Articles file and numbered 9 and 10 in Spisuk_Publikacii do not correspond to the titles of the submitted publications.

5.The reviewer's personal impressions of the candidate. I do not know Dr. Petya Popova-Krumova

CONCLUSION

Ch. Assist. Prof. Dr. Petya Popova-Krumova participated in the competition with 18 scientific works, of which two monographs and one book chapter, with two useful models and three patents. 32 citations were identified in scientific publications, referenced and indexed in world-renowned databases of scientific information, or in monographs and collective volumes. She participated in the development of eight projects and led two others.

Table 1

Group of indicators	Content	Minimum points required	Points achieved by the Ch. Assist. Prof. Dr. Petya Popova-Krumova
A	1. Dissertation work for awarding the educational and scientific degree "doctor"	**50**	**50**
B	4. Habilitation thesis - scientific publications in publications that are referenced and indexed in world-famous databases with scientific information (Web of Science and Scopus)	**100**	**113**
G	5. Published monograph that is not presented as the main habilitation thesis		2x30=**60**
	7. Scientific publication in publications that are referenced and indexed in world-famous databases with scientific information (Web of Science and Scopus), outside of the habilitation thesis		2x12=**24**
	8. Published book chapter or collective monograph		1x15=**15**
	9. Invention, patent or utility model, for which a protective document has been issued in due order		5x25=**125**
	Sum of indicators from 5-10	**220**	**224**
D	11.Citations in scientific publications, referenced and indexed in world-renowned databases of scientific information, or in monographs and collective volumes		32x2=**64**
	Points by indicator 11	**60**	**64**
	Total points	**430**	**451**

Table 1 shows the fulfillment of the minimum requirements for the occupation of the academic position "Associate Professor" at the BAS for the professional direction 4.2 Chemical Sciences by Dr. Petya Popova-Krumova.

According to the group of indicators A, the candidate fulfilled the minimum required points, and according to the group of indicators B, G and D, the minimum required points were exceeded, which also applies to the total number of points.

Regarding the fulfillment of the requirements for occupying the academic position of "Associate Professor" at IChE-BAN according to criterion 1 - the requirements are met, according to criteria 2-7 the minimum requirements are exceeded. The only exception is Criterion 8 - Recommended Hirsch Index of no less than 4. Applicant's H Index is 3, but I believe this can be offset by the applicant's over-fulfilment of criteria 2-7.

Ch. Assist. Prof. Dr. Petya Popova-Krumova has satisfied all the requirements of ZRASRB, the Regulations for its implementation, the Regulations for the terms and conditions for acquiring scientific degrees and holding academic positions at the BAS, as well as the requirements for holding the academic position of "Associate Professor" at IChE - BAS with one exception - criterion 8. My assessment of the candidate's overall activity is positive.

Everything stated in the standpoint gives me reason to propose Ch. Assistant Professor Dr. Petya Georgieva Popova-Krumova, to take the academic position of "Associate Professor" in the professional direction 4.2. Chemical Sciences (Processes and Apparatus in Chemical and Biochemical Technology) at the Institute of Chemical Engineering - Bulgarian Academy of Sciences.

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Wrote the standpoint:
/Prof. Dr. Eng. Kosta Boshnakov/