

Review



regarding to a competition for holding the academic position "Associate Professor" in professional field **4.2. Chemical Sciences "Processes and Apparatus in Chemical and Biochemical Technology"**, for the needs of the laboratory "Innovative Processes and System Engineering" of the Institute of Chemical Engineering at Bulgarian Academy of Sciences, announced in the state newspaper no. 96 (02.12.2022)

Candidate: **Assist. Prof. Dr. Eng. Petya Georgieva Popova-Krumova**

Reviewer: **Assoc. Prof. Dr. Eng. Elisaveta Georgieva Kirilova**

1. Brief biographical data and description of the candidate's scientific interests

Assist. Prof. Petya Georgieva Popova-Krumova is the only candidate in the competition for holding the academic position "Associate Professor", announced for the needs of the laboratory "Innovative Processes and System Engineering" of the Institute of Chemical Engineering at the Bulgarian Academy of Sciences by professional field 4.2. Chemical Sciences "Processes and Apparatus in Chemical and Biochemical Technology". Dr. Petya Popova-Krumova was born on April 11, 1975 in Burgas, Bulgaria. She graduated from the University "Prof. Dr. Asen Zlatarov"- Burgas, receiving BSc degree in Ecology and protection of the environment and man in 2000 and MSc degree in Chemical Engineering in 2004. During the period 2004-2008 she was a full-time PhD student in the Laboratory of Process Systems Engineering, currently Innovative Processes and Systems Engineering of the Institute of Chemical Engineering at the Bulgarian Academy of Sciences. In 2011 Petya Popova-Krumova received the PhD degree in scientific specialty 4.2. Chemical Sciences "Processes and Apparatus in Chemical and Biochemical Technology" with a dissertation entitled "Parameters Determination in models of chemical engineering processes". The scientific interests of Assist. Prof. Petya Popova-Krumova are in the field of modeling the interphase mass and heat transfer in industrial column apparatuses, in which the processes of absorption, adsorption, distillation and catalysis take place, as well as creation of models of biochemical processes and identification of kinetic parameters in these models. Since 2004 up to now, the candidate has worked at the Institute of Chemical Engineering at the Bulgarian Academy of Sciences, Sofia, and since 2011 she has working at the position of assistant professor in the same scientific organization. Dr. Popova-Krumova speaks English, Russian and German languages.

2. General characteristics of the candidate's scientific research and applied scientific activity

Assist. Prof. Popova-Krumova was a participant in three projects financed by the National Science Fund, Ministry of Education and Science of the Republic of Bulgaria (BNSF) under competitions for the funding of fundamental scientific research and the bilateral cooperation between Bulgaria and Russia. During the period of 2003-2008, Dr. Popova-Krumova also participated in four international cooperation projects within the framework of inter-academic contracts and agreements (EBR) of the Bulgarian Academy of Sciences and Ben Gurion, Tel Aviv and Haifa Universities, Israel. In the period of 2009 - 2011 she was a participant in a project financed under the "Human

Resources Development Operational Program 2007-2013" of the European Union. During the period of 2012 - 2014 Assist. Prof. Popova-Krumova was a leader of one project financed by the BNSF under a competition for funding fundamental scientific research of young scientists and postdoctoral students. The candidate was a member and secretary of the organizational and scientific committees of 5 scientific forums organized and held during the period of 2018 – 2022. Dr. Popova-Krumova has also prepared anonymous reviews of papers for the journals: Chemical and Biochemical Engineering Quarterly, Bulgarian Chemical Communications. She also participates in the International Scientific Center for Power and Chemical Engineering Problems. Assist. Prof. Popova-Krumova received 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.

3. Evaluation of the presented materials

Those presented by Assist Prof. Dr. Petya Georgieva Popova-Krumova materials show that the minimum national requirements for the academic position "Associate Professor" are met according to the Regulations for the terms and conditions for holding the academic positions in the Bulgarian Academy of Sciences (RAPBAS) and the Regulations for the application of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDAS in RB). They are united by groups of indicators, it is as follows:

Indicator A: Received PhD degree, Diploma №000004/15.09.2011, for which the candidate receives 50 points from a minimum 50 points.

Indicator C: 4. Habilitation thesis - scientific publications in referenced and indexed in world databases with scientific information (Web of Science and Scopus). On this metric, the candidate submitted 8 publications that are distributed by quartiles as follows: 1 in Q1, 1 in Q2, 4 in Q4, and 2 publications that have no quartile but are with SJR. These publications give a total of 113 points from a minimum 100 points.

Indicator D: 5. Published monograph that is not presented as the main habilitation thesis. According to this indicator, the candidate has submitted 2 books, for which he receives 60 points; 7. Scientific publication in referenced and indexed in world databases with scientific information (Web of Science and Scopus), outside of the habilitation thesis. According to this indicator, the candidate has presented 2 publications in quartile Q4, for which he receives 24 points. 8. Published book chapter or collective monograph. According to this indicator, the candidate has submitted 1 book chapter, for which he receives 15 points; 9. Invention, patent or utility model, for which a document has been issued. According to this indicator, the candidate has presented 3 patents and 2 utility models, for which he receives 125 points. According to indicator D, the candidate receives totally 224 points from a minimum of 220 points.

Indicator E: 11. Citations in scientific publications, monographs, collective volumes and patents, referenced and indexed in world databases of scientific information (Web of Science and Scopus). According to this indicator, the candidate presented 32 citations in Web of Science and Scopus, for which he received 64 points.

When comparing the presented materials with the minimum requirements (Table 1) for the academic position "Associate Professor" in Research field 4. Natural sciences, mathematics and informatics, professional field 4.2. Chemical Sciences, according to the Regulations for the application of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for the

terms and conditions for academic positions in the Bulgarian academy of Sciences, it follows that the minimum requirements for applying the academic position "Associate Professor" have been met.

Table 1. Minimum required points by groups of indicators for the academic position "Associate Professor" and number of points of the candidate by individual indicators.

Indicators	Content/Indicator	Number of points of the candidate	Minimum required points for "Associate Professor"
A	1. Dissertation thesis for receiving PhD degree	50	50
C	4. Habilitation thesis - scientific publications in referenced and indexed in world databases with scientific information (Web of Science and Scopus)	113 -1 public. in Q1; -1 public. in Q2; -4 public. in Q4; -2 public with SJR	100 25 for public. in Q1 20 for public. in Q2 15 for public. in Q3 12 for public. in Q4 10 for public. with SJR without IF
D		224	220
	5. Published monograph that is not presented as the main habilitation thesis.	60 -2 monographs	30
	7. Scientific publication in referenced and indexed in world databases with scientific information (Web of Science and Scopus), outside of the habilitation thesis	24 -2 public. in Q4	25 for public. in Q1 20 for public. in Q2 15 for public. in Q3 12 for public. in Q4 10 for public. with SJR without IF
	8. Published book chapter or collective monograph	15 -1 book chapter	15
	9. Invention, patent or utility model, for which a document has been issued	125 -3 patents -2 utility models	25
E		64	60
	11. Citations in scientific publications, monographs, collective volumes and patents, referenced and indexed in world databases of scientific information (Web of Science and Scopus)	64 -32 citations	30
Totally		451	430

Assist. Prof. Popova-Krumova has presented a report on the requirements for holding the academic position "Associate Professor" at Institute of Chemical Engineering at the Bulgarian Academy of Sciences, which shows satisfaction of these indicators as well. The latter is shown in Table 2.

Table 2. The requirements for holding the academic position "Associate Professor" for the Institute of Chemical Engineering at the Bulgarian Academy of Sciences.

№	Criterion, normative document	Requirement (minimum)	Submitted by the candidate
1.	PhD degree, LDAS of RB	yes	yes
2.	Years for folding the academic position "Assistant Professor", LDAS of RB	2 years	11 years
3.	Number of publications, other than those submitted for receiving the PhD degree, RAPBAS	15	18
4.	Total number of publications, RAPBAS	20	27
5.	Number of publications in refereed journals	15	20
6.	Number of journal publications with ISI Impact Factor or SJR	5	12
7.	Общ брой на забелязаните цитати върху всички трудове, Правилник на ИИХ-БАН Total number of noticed citations on all publications, RAPBAS	20	41
8.	Recommended Hirsch index, RAPBAS	4	3

Materials submitted for review other than the PhD thesis can be grouped into the following categories:

Table 3. Grouping of the submitted materials outside the PhD thesis by categories.

Type	Total number	Issue	IF/SJR	Q	Year
Book	2	Springer-Verlag	-	-	2016, 2018
Book chapter	1	B P International	-	-	2022
Paper in journal with ISI IF/SJR	10	Journal of Physics: Conference Series, IOP Publishing (2)	SJR:0.227	-	2020
		Bulgarian Chemical Communications (3)	SJR:0.14	Q4	2020
		Chemical Engineering & Technology (2)	ISI IF: 2.442; 2.385	Q1, Q2	2014, 2015
		Recent Innovations in Chemical Engineering (2)	SJR: 0.102	Q4	2014, 2015
		AIP Conference Proceedings, American Institute of Physics (2)	SJR: 0.164	-	2013
Paper in a refereed journal	5	Mathematical modeling (1)	-	-	2017
		International Journal of Engineering Research (2)	-	-	2015
		Open Access Library Journal (1)	-	-	2014
		Transactions of Academenergo (1)	-	-	2012
Patents and utility models	5	-	-	-	2013, 2014, 2020

In the publications submitted to review, the candidate participated as first author in 7 of them, 2nd place in 4 works and 3rd in 11. This shows independence in conducting scientific research, as well as teamwork skills.

4. Basic scientific and scientific-applied contributions

Based on the materials provided to me for review, I would summarize the candidate's scientific and applied scientific contributions as follows:

Scientific contributions:

1. Development of a regularization method for parameter identification when solving incorrect and essentially incorrect inverse problems using a simplex method with an optimization criterion - least squares function (**Publication No. 27**).
2. Development of a hierarchical approach for solving multiparameter models with the use of polynomial approximations of experimental data necessary for the identification of parameters. The obtained coefficient values through this hierarchical approach can be used as null approximations in the parametric identification problem and they are the initial hierarchical level in the identification procedure (**Publications No. 1, 16, 19, 22, 23, 24, 25, 26**).
3. Development of an approach for modeling the interphase mass transfer, in industrial column apparatus, in which the processes of absorption, adsorption and catalytic processes take place, which is based on the models of convection-diffusion and models of average concentrations (**Publications No. 5,6,7,8,9,10,11,12, 13, 14,15,18, 20**).
4. Investigation of the effect of maldistribution of gas and liquid phase velocities in industrial column apparatus during physical and chemical absorption processes (**Publications No. 2,3**), homogeneous and heterogeneous chemical reactions (**Publication No. 17**) and distillation (**Publication No. 4**).

Scientific-applied contributions:

1. Application of the created hierarchical approach to modeling the following processes:
 - biotechnological processes (**Publications No. 1, 23**), which include a process of biotransformation of crude glycerol obtained as a by-product in the production of biodiesel to obtain the products valuable for the chemical industry 1,3-propanediol and 2,3-butanediol by using *Klebsiella oxytoca* (**Publication No. 16**);
 - process of heat and mass transfer during regeneration of heat and moisture in a column apparatus with packing using composite adsorbent "CaCl₂/aluminum oxide" (**Publications No. 19, 24, 25**);
 - algae photosynthesis process in an airlift bioreactor (**Publications No. 22, 23**);
 - gluconic acid production process (**Publication No. 26**).
2. Application of the approach to modeling the interphase mass transfer in industrial column apparatuses for purification of waste gases from thermal power plants in which take place processes: absorption (**Publications No. 5,6,7,8,9,10,11,14,15,18,20, 2 patents and 3 utility models**), adsorption (**Publication No. 12**) and catalysis (**Publication No. 13**).

5. Reflection of scientific publications in the literature

The candidate has submitted 41 citations, of which 32 are citations in scientific publications referenced and indexed in world databases with scientific information (Web of Science and Scopus).

6. Critical notes and recommendations

When checking all the materials for the competition, I found the absence of publication 21, which brings the total number of publications with which the candidate participates in the competition for the academic position "Associate Professor" to 26. The latter does not significantly change the points for fulfilling the minimum requirements, as can be seen from Tables 1 and 2 presented in section 3, but it is rather a remark.

7. Personal impressions of the reviewer about the candidate

I know Assist. Prof. Petya Popova-Krumova since 2004, when she was enrolled as a full-time PhD student in the Process Systems Engineering Laboratory, currently "Innovative Processes and Systems Engineering" at the Institute of Chemical Engineering at the Bulgarian Academy of Sciences. Over the years, she established herself as a experienced researcher with deep knowledge in the field of her scientific interests. Dr. Popova-Krumova has shown over the years high organizational skills, as well as the ability to work effectively in a team on joint scientific projects and tasks.

CONCLUSION

The materials presented to me for review are in accordance with the the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation as well as the Regulations for the terms and conditions for holding academic positions at the Institute of Chemical Engineering at Bulgarian Academy of Sciences. Bearing in mind their importance, as well as that of the contributions contained in them, I consider it reasonable to propose **Assist. Prof. Dr. Eng Petya Georgieva Popova-Krumova**, to hold the academic position of "Associate Professor" in professional field **4.2. Chemical Sciences "Processes and Apparatus in Chemical and Biochemical Technology"**.

Data 13.03.2023

Reviewer: 

/Assoc. Prof. E. Kirilova/