REPORT

on a competition for 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 systems engineering"

announced in SG No. 17, dated 21.02.2023.

with a candidate: Chief assistant professor Boyan Hristov Boyadzhiev
(name, scientific degree, academic position)

reviewer: Assoc. Prof. Dr. Dimitar Peshev
(name, scientific degree, academic position)

1. Brief biographical data and description of the applicant's scientific interests.
2. General characteristics of the candidate's scientific research and applied scientific activity.

In the last five years, Chief assistant professor Dr. Boyan Hristov Boyadzhiev has demonstrated high research and organizational activity. He took part in three research projects funded by the "Scientific Research Fund" at the Ministry of Education and Culture. He also actively participates in organizing committees of scientific forums in the field of chemical engineering. He is a member of the international organization "International Scientific Center for Power and Chemical Engineering Problems".

An evidence for the applied scientific activity of the candidate is the 3rd place in the category "Best innovative project" for 2017 by the innovation council of the Bulgarian Chamber of Commerce and Industry (BCC), awarded for the project "New absorption-adsorption method and apparatus for purifying waste gases from sulfur dioxide'.

The research and applied activity of the Chief assistant professor Boyan Boyadzhiev not only cover, but exceed the average level for the academic degree taken.

3. Evaluation of the presented materials (number and characteristics of the presented works - scientific publications, monographs, research projects, patents, textbooks, etc.).

4. Basic scientific and applied contributions.

The candidate's research work is primarily theoretical. Using the methods of mathematical modeling, the mechanisms and kinetics, respectively the resistances, of the transfer processes at the interphase surface in heterogeneous reactors and mass transfer apparatuses were investigated. Apart from this, various aspects in the modeling of column apparatuses have been extensively investigated. Improved model equations are proposed to describe the operation of column apparatus in which various special processes are carried

out –sulfur dioxide capture at low concentrations of sulfur dioxide in a large volume of effluent gases; physical and chemical countercurrent absorption; non-stationary adsorption; heterogeneous catalytic processes in industrial column apparatus. Several publications present a new approach to modeling interphase mass transfer processes - absorption (chemical or physical), adsorption and catalytic processes by using convective-diffusion models for qualitative analysis of the effect of the velocity radial nonuniformity in the column and avarage-concentration models for quantitative description of mass transfer in industrial column apparatus. Some of the works used experimental data to determine the parameters in the mathematical models. As a drawback, it can be noted that the proposed model equations and the numerical algorithms for their solution are not subjected to experimental verification by comparison with experimental data from pilot and industrial scale installations.

The scientific publications presented in the doctoral dissertation focus on the development of mathematical models to describe the operation of column apparatus and their application in the capture of sulfur dioxide in waste gases, which subsequently led to the publication of one patent and useful model.

Within the group of indicators B, the candidate has submitted five monograph-equivalent publications, which do not repeat those previously submitted for the acquisition of scientific degree(s) and/or habilitation. Formally presented publications meet the minimum national requirements. Three of them have an impact factor and are fundamental in nature. Investigated are: the influence of interphase concentration on the mechanism and kinetics of transfer processes in systems with intense interphase mass transfer; the non-stationary kinetics of evaporation, in which an analysis of the stability of the Oberbeck-Boussinesq equations was also made. The remaining two publications are of impact rank and concern some aspects of modeling the operation of column apparatus.

The scientific contributions can be qualified as enrichment of existing knowledge and theories in relation to the modeling of interfacial transfer processes, the design and operation of column mass exchangers and heterogeneous reactors.

6. Reflection of the candidate's scientific publications in Bulgarian and foreign literature. Citations are recognized only in scientific publications and in defended dissertations in which the applicant is not a supervisor or consultant. Citation of a scientific publication by a co-author is considered a self-citation and is excluded from the list of citations of each of the co-authors of the scientific publication.

A total of nine of the 24 research papers presented were cited, with the main number of citations of the 65 observed being to several of the candidate's early publications published in prestigious impact factor journals as well as published book chapters. According to the "Methodology for the growth of scientists at IChE - BAS", the total number of noticed citations on all works of the candidate must be a minimum of 20 (twenty), and according to the "Regulations for the implementation of the law on the development of the academic staff in the Republic of Bulgaria" there are 25 . Obviously,

although the reflection of the candidate's scientific publications in the Bulgarian and foreign literature is not impressive, it exceeds the statutory minimum requirements several times. A large part of the presented citations are from authors with whom Chief Assistant professor Dr. Boyan Christov Boyadzhiev participated in scientific teams on projects

7. Critical notes and recommendations.

In order to increase the impact of the candidate's research activity in the world literature and to increase the probability of a favorable effect on solving current societal challenges by applying the achieved scientific results in the industry, it is necessary to aim at diversifying the researched problems and publishing in specialized journals with a high impact factor, as well as reporting to specialized scientific forums with a wider geographical coverage.

8. Personal impressions of the reviewer about the candidate.

I have no personal impressions of the candidate.

C O N C L U S I O N

As a result of the review and analysis of the submitted documents for the announced competition, I express my positive assessment that the application of the Chief Assistant Professor Dr. Boyan Christov Boyadzhiev meets all the qualitative and quantitative requirements and I recommend the responsible authority at the Bulgarian Academy of Sciences to choose him as an Associate Professor in professional direction 4.2. Chemical Sciences (Processes and Apparatus in Chemical and Biochemical Technology) for the needs of the "Innovative Processes and Systems Engineering" laboratory.

Date: 15.06.2023

Reviewer: [redacted]

/Assoc. Prof. D. Peshev/