

REVIEW

by competition for an associate professorship at the Institute of Engineering Chemistry at the

BAS

announced in SG No. 66/16.8.2022 with candidate Dr. Boyan

Reviewer: Prof. Dr. Venko N. Beschkov

Professional direction 4.2. Chemical Sciences (Processes and Apparatus in Chemical and Biochemical Technology).

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

The candidate Boyan Hr. Boyadzhiev was born in the city of Sofia in 1972. He completed his secondary education at NPMG "Acad. L. Chakalov" in Sofia majoring in "mathematics". He received his higher education and master's degree in computer science at the Technical University in Sofia in 1995.

In 2018, he became a doctoral student at the Institute of Engineering Chemistry at the BAS, where in 2020 he defended a dissertation for the educational and scientific degree "doctor" (PhD) on the topic "Computer modeling of processes in column apparatuses". For the period 2021/2023, he holds the scientific position of "principal assistant" at the same institute.

2. General characteristics of the candidate's scientific-research and scientific-applied activity (including participation in national and European contracts, expert activity, supervision of doctoral students, scientific-organizational activity, etc.).

The scientific research activity of the candidate is determined by his qualifications, knowledge and experience. The main topic of his research is mathematical modeling of transfer processes in multiphase flows, mostly processes influenced by nonlinear effects: intensive mass transfer with influence on phase flows (liquid, gaseous). A main tool in his research practice is the mathematical modeling and numerical solution of the partial differential equations of motion and energy transfer in moving multiphase systems. He has participated in 4 projects financed by the Scientific Research Institute (on the same topic), one of which is international (with the Russian Federation), as well as in the organization of 4 international scientific forums.

He is the winner (in a team) of a gold medal for the development "Absorption-adsorption apparatus and method for purifying gases from sulfur dioxide" at the 10th national exhibition ITI-2017 and third place for "Best innovative project" from the BTPP, 2017

The candidate is proficient in multiple programming languages and software products and has broad competencies in the design, construction and administration of computer networks. All this speaks of the candidate's high qualification and skills in the field of research conducted by him.

3. Evaluation of the presented materials

The total scientific output of the candidate is 24 scientific papers. A total of 65 citations were noted (excluding self-citations).

Candidate Dr. B. Boyadjiev presented himself at the competition for associate professor with 24 scientific publications, all in refereed scientific journals and one chapter of a scientific book in co-authorship. Journal articles scored for quartiles are as follows: With Q1- five; with Q2 – four; with Q3 – none; with Q4 – five. Of the remaining works, four are co-authored monographs (2) and chapters in collections (2). Three of them are publications of the renowned Springer publishing house (the candidate is a co-author of monographs 7 and 12). Papers 4 and 5 were published in the International Journal of Modern Trends in Engineering and Research, for which I found an impact factor of 1.71, but no quartile score data. All works are on the theme of the competition.

The scientific-metric indicators of the candidate exceed the requirements of the Law on the Development of the Academic Staff (ZRAS) and of the BAS: 587 points against the required 460 points for scientific publications; according to the total number of publications according to the requirements of IIH (including in journals with an impact factor) – 24 (16 with IF) against the required 20 (15); 65 citations were noticed against the required ten under the Regulations of ZRAS and against the required twenty under the Regulations of IIH-BAN. The H-index of the candidate is 4, if required by the Regulations of the IIH H \square 4. From the reference made, it can be seen that the candidate fully meets the scientometric requirements for the academic position "associate professor" in the Regulations of ZRAS, BAS and IIH for holding academic positions.

4. Basic scientific and scientific-applied contributions.

Papers 1 to 15, which are outside of the candidate's dissertation (papers 16-24), will be reviewed. The papers on which the dissertation is based will not be reviewed, as they have already received their assessment. They are taken into account for the general scientometric characteristics of the candidate.

The papers with which Dr. Boyadjiev appeared at the competition are grouped into two research areas:

- Nonlinear effects in two-phase systems with intensive mass transfer and intensive mass exchange. Here, the effects of intense flows of matter through the interphase surface and in the volume of the phases are taken into account. In these cases, there is a secondary effect on the flow regime together with convective mass forcing. These are papers 1-3. The mathematical description of these processes requires solving the equations of motion in a non-linear form, which requires in-depth mathematical knowledge.
- Mathematical description and modeling of two-phase and three-phase flows in column apparatuses (papers 4-15). The approach to setting the task is essential here. Since discrete fluid phases are present, an approximation of fluids in continuous phases and with averaged axial velocities is proposed. The comparison with experimental results gives reason to adopt this approach for practical purposes.
- The proposed approach is applied to the description of forward (paper 8) and countercurrent (paper 9) flows with the gas-liquid system.
- The same approach is developed and generalized for a wide class of cases in papers 4-7 and in papers 12-15, with special attention paid to three-phase systems in papers 6, 10, 11.

All research was carried out using modern mathematical (numerical) methods.

The applicant also submits 4 patents (one for selection and three for utility model) in the field of the competition. They offer technical solutions for column devices for capturing harmful gases in two-phase and three-phase systems.

I define the candidate's contributions as «enrichment of existing knowledge and theories» using modern research methods. The scientific results achieved with the developed methodology will be of great benefit to the topics of IIIH in the field of waste gas purification, the modeling and design of column apparatuses (mass exchange equipment and catalytic reactors), and to the improvement of practical methods for purifying the air from harmful gases. (e.g. sulfur dioxide).

5. Reflection of the candidate's scientific publications in the Bulgarian and foreign literature.

A list of 65 citations to the candidate's works is presented. The H-index of the candidate is 4 according to known databases. This is a high enough indicator for the scientific field in which he applied.

6. Critical notes and recommendations.

I have no particular critical remarks about the candidate's works. I would recommend that he start his career as a postdoctoral researcher by attracting collaborators and PhD students with practical interests.

7. Personal impressions of the reviewer about the candidate.

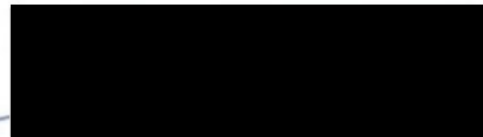
Dr. Boyan Boyadjiev presents himself as an independent and excellently prepared specialist in his field. The awarding of the academic post of "associate professor" will give him the opportunity to improve the research work at IHH-BAS and the guidance of young scientists at the institute.

CONCLUSION

Everything stated so far gives me reason to confidently recommend to the scientific jury of the competition to award Dr. Boyan Hristov Boyadjiev the academic position and the scientific title of "associate professor".

Sofia, 06/09/2023

Reviewer:

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(Prof. PhD Venko N. Beshkov)