

EVALUATION REPORT

On a procedure for holding the academic position "professor" announced by IOMT-BAS in SG №19 dated 04.10.2022 in the professional field 4.2. "Chemical Sciences" scientific specialty "Physical chemistry "

Candidate: Daniela Boganova Karachanova, PhD, associate professor at IOMT-BAS

Member of the scientific jury: Georgi Lalev Dyankov, PhD, professor at IOMT-BAS

1. General description of the submitted materials

(The indicators and quartiles quoted below (marked with "italic") are defined in the Regulations for implementation of the 3PACPБ, Professional Area 4.2, Tables 1 and 2)

In the competition for the academic position of "professor" for the needs of the laboratory "scientific and technical department " at IOMT-BAS the only candidate is Assoc. Prof. Dr. Daniela Boganova Karachanova.

The materials submitted by the candidate under the competition include all documents required according to 3PACPБ.

Indicator B4 - habilitation work includes 4 publications with quartile Q1 and 2 publications with Q2, providing 140 points (necessary at least 100).

Indicator G7 presents 12 scientific papers: 9 in Q1, 2 in Q2 and 1 in Q3. *Indicator G9* also includes one patents. All these provide 305 points on *indicator G* (necessary at least 220).

The publications with which the candidate applied for the competition of the academic position of "professor" were published in the period 2012-2022. All scientific papers presented in *indicators B4 and G7* were published after the defense of the dissertation for "doctor" and the competition for "Associate Professor" and are not included in the NACID database to cover the minimum national requirements for the academic position of "Associate Professor" held by Dr. Karachanova.

A list of 84 independent citations is presented (168 points on *indicator D11* at min. 200).

According to *indicator E*, lists for participation in 12 national and 5 international scientific projects in which Prof. Karashanova participated are presented. She was also the head of 2 national scientific and educational projects. All this provides 260 t points, with a minimum requirement of 150 t.

2. General characteristics of the scientific, scientific-applied and pedagogical activity of the candidate;

The scientific and scientific-applied activity of the candidate is in the field of electron microscopy and its application in materials science and can be summarized and grouped into 3 thematic areas according to the studied materials and applications as follows:

- Transmission electron microscopy of materials with catalytic properties;

- Transmission electron microscopy of graphene and thin-film systems;
- Transmission electron microscopy of metal and composite nanoparticles obtained by laser ablation in different environments.

Assoc. prof. Karashanova has a leading role in these studies, i.e. she sets research tasks, plans and conducts transmission-microscopic studies of materials and systems diversified in their nature, structure and properties, as well as in the analysis of data related to their morphology, microstructure and phase composition.

The obtained results are related to establishing the microstructure and phase composition of innovative catalytic materials created and applied in various reactions - from the production of pure hydrogen to the neutralization of volatile organic compounds and the decomposition of formaldehyde and methanol.

In the study of graphene and thin-layer systems, the results are related to the technology of sample preparation, conducting the TEM observations that were applied to the relevant techniques for collecting the maximum amount of reliable information, also for analysis and interpretation of the obtained data.

TEM studies of metal and composite nanoparticles, obtained by laser ablation in different environments, resulted in determination of the morphology, microstructure and phase composition of the ablated material. The small amounts of synthesized materials are a challenge for TEM research, that emphasizes the significance of the obtained results, both in terms of clarifying the role of ablated material in composite materials, and in terms of the parameters of the ablation process.

The achieved results present Prof. Karashanova as a scientist with a very high qualification, which corresponds to the academic position of "professor".

Prof. Karashanova was the supervisor of 3 bachelor theses of students from the Faculty of Science of the Sofia University and from the HTMU. She is the main lecturer in the Center for Doctoral Students at the BAS on the topic "Electron Microscopy". She is the chairperson of the organizing committee of the national forum for doctoral students and young scientists: Spring seminar of doctoral students and young scientists from BAS named "Interdisciplinary Chemistry", which has a 15-year tradition.

3. Main scientific and applied scientific contributions.

Scientific research contributions in the first thematic area comprise the results of the study of catalytic materials in which the active phase is a metal in the form of nano-sized particles finely dispersed on the surface of a substrate. The morphology and phase composition of the nanoparticles as well as those of the substrates were determined. Catalysts based on oxides on porous substrates have been investigated. The study with bright field TEM allowed to establish the morphology of the individual components of the catalyst upon substrate impregnation with the ferrite nanoparticles of salts of three metals (Co, Zn, Fe).

Scientific-research contributions in the second thematic area are establishing the efficiency of technology for obtaining graphene, by TEM visualized bilayer graphene layers and studying

their morphology. Carbon layers deposited under different modes of laser ablation were also investigated, and the crystallographic directions of growth of the layers were established. Particles of different morphological phases were detected and the laser ablation parameters at which they were obtained were established.

Scientific-research contributions in a third thematic area are the systematization of the parameters of laser ablation in which nanoparticles of a certain size and shape are obtained repeatedly. By means of TEM and SEM, the size and shape of Ag and Au nanoparticles embedded in a glass substrate were investigated and conclusions were made about the pulse ablation parameters in terms of wavelength, duration, number of pulses and energy density.

The main scientific and scientific-applied contributions of assoc. prof. Karachanova can be attributed to the following categories: creation of new classifications, methods, and technologies; obtaining and proving new facts; application of scientific achievements in practice.

4. I have no critical remarks and recommendations on the submitted works

A small error was made, with the non-reporting of article B7, which reduces the candidate's achievement in *indicator G* - the actual number of points is 305, not 280.

5. Reasoned and clearly formulated conclusion

The publications and documents submitted by Associate Professor Daniela Karashanova characterize her as a leading specialist in the field of the announced competition. She is capable of leading research at the highest scientific level in the field of physical chemistry, especially in electron microscopy. Prof. Karashanova's academic performance exceeds the minimum national requirements for holding the academic position of "professor" laid down in the ZRACPB and the related regulations of the BAS and IOMT. Based on the above, I express my positive opinion and support without hesitation the candidacy of Assoc. Dr. Daniela Bogdanova Karashanova for the academic position of "Professor" at the Institute of Optical Materials and Technologies "Acad. J. Malinovki» at the BAS, professional direction 4.2. "Chemical Sciences" scientific specialty "Physical chemistry".

30 January, 2023

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/Prof. Georgi Dyankov, PhD/