

REVIEW

by Prof. Bogdan Stavrev Rangelov, Institute of Physical Chemistry, Bulgarian Academy of Sciences, member of scientific jury – competition on academic position “Associate Professor”, 4.2. Chemistry sciences, Physical chemistry, IOMT-BAS, published in SG-number 35/10.05.2022.

The competition on academic position “Associate Professor”, 4.2. Chemistry sciences, IOMT-BAS, is announced in SG-number 35/10.05.2022. One candidate only participates in this competition, namely Assist. Prof. Biliana Chavdarova Georgieva, PhD. The presented materials for participation in the competition procedure are complete, well structured and collected, described in details with attached evidence materials and in accordance with the National requirements and the Rules for Academic Development in IOMT-BAS and allow evaluation of the candidate participating in the competition.

I. Analysis of the career profile of the candidate.

Biliana Chavdarova Georgieva graduated from Sofia University "St. Kl. Ohridski", Faculty of Chemistry, Department of "Inorganic Chemistry", as a Master in Chemistry, specialty "High pure substances and materials based on them" in 1997. She started working as a chemist in 2000 at the Central Laboratory of Photoprocesses, BAS, (now IOMT, BAS), in the "Laser Induced Processes in Solids" laboratory. In 2012, she defended Ph.D. in Physical Chemistry - a dissertation on "Vacuum-deposited Sn-O-Te layers as sensors for moisture and reducing gases." In the meantime, she holds the positions of chemist, research assistant, assistant (Laboratory "Nanostructured Materials and Technologies" at IOMT), and from 2013 until now the position of assistant professor in IOMT, BAS (Laboratory "Electron Microscopy"). Dr. Biliana Georgieva carries out also regular pedagogical/teaching activities, mainly related to the presentation of the possibilities of transmission electron microscopy for the study of nanomaterials. The candidate is an administrator for the IOMT, BAS of the Centre of Excellence "National Centre for Mechatronics and Clean Technologies", a project manager under project financed by the OP "Human Resources Development" and coordinator for IOMT, BAS as a partner organization of two projects financed by National Science Fund (FNI), participant in six projects financed by FNI, too.

II. General description of the presented data materials.

Assistant Prof. Biliana Chavdarova Georgieva has submitted all the necessary documents and the relevant evidence to them according to the national requirements (ZRASRB) and the Regulations of the IOMT for the application of the

ZRASRB: curriculum vitae, Ph.D. diploma, abstract(s), articles for habilitation thesis, list of publications, list of citations, list of participations in international and national projects, reference to original scientific contributions, summaries and copies of publications, etc. The submitted materials for participation in the competition are complete, well structured, carefully collected and described in detail with attached evidentiary material.

III. Evaluation of the scientific activity and overall academic career.

In the competition procedure for associate professor position, the candidate participate with 19 articles in journals with IF, thus fully meets the requirements regarding the required number of points for indicators "B" and "Γ". A large part of the publications are in collaboration with scientists outside IOMT-BAS, which shows that the candidate is a valued expert in the field of physical chemistry and related sciences. 46 citations (excluding self-citations) are also presented in the competition. The candidate's Hirsch factor is six, and the total number of citations is 140. Conference participations are 73. In general, the candidate's scientific and scientific-applied contributions are related to the study and characterization of nanomaterials using Transmission Electron Microscopy and Electron Diffraction (morphology, structure and phase/elemental composition) and can be divided into: (i) investigation of functional properties of nanomaterials based on metal oxides, (ii) investigation of transition metal oxides (Fe, Cu, Zn, Ni, etc.) and their role as solid catalysts, (iii) resistive sensing elements/sensors for humidity, based on thermal-vacuum deposited organic and inorganic thin films, (iv) thin films of Nb-, Ta- V- oxides, with additionally structured mesopores in view of their application as optical sensors for volatile organic vapours, (v) metal nanoparticles, obtained by "green" synthesis with potential for applications in medicine, pharmacy, electrochemistry, as biosensors and catalysts for detection and elimination of biotoxins, etc.

The obtained results can be summarized as:

- New data were obtained on the type of adsorption of water molecules on the surface of thin polyimide and SnO₂ films. In SnO₂ films obtained by co-vacuum deposition, the presence of both electronic and ionic conductivity was demonstrated for the first time by impedance spectroscopy, which was associated with both chemical and physical adsorption of water molecules on the sensor film surface.
- By transmission electron microscopy and electron diffraction, the morphology and structure of dense and mesoporous Nb-, Ta- and V-oxide thin films obtained by sol-gel and spin-coating methods are proved. The formation of mesopores was demonstrated when an organic template was added to the starting sol. The size of the mesopores and their arrangement were evaluated. The amorphous structure of thin oxide films has been proved.
- For the first time, by Transmission Electron Microscopy and Electron Diffraction, the morphology and the structure as well the phase composition of silver nanoparticles obtained by "green" synthesis in water extracts from the waste products of the flowers of Rosa Damascena, Achillea millefolium and Lavandula angustifolia are proven.

IV. Evaluation of the habilitation thesis, or equal weight publications.

The candidate presents five peer-reviewed monograph publications, three of which fall into quartile Q1 (one in the top the ranking list) and two into quartile Q2.

The main results and contributions in the presented materials can be summarized as follows:

- The presence of silver nanoparticles in zinc oxide nanostructures obtained by the method of pulsed laser deposition and subsequent annealing with laser radiation has been proven.
- The formation of nanostructures of ZnO, ZnO doped with Au, TiO₂, SnO₂ and MoO₃ obtained for the first time by the method of pulsed laser deposition in air is presented, and their morphology, structure and phase composition are determined.
- The morphology, structure and phase composition of the active component of a supported catalyst supported by activated carbon were determined. This contributes to elucidating the mechanism of the decomposition process of methanol and the subsequent production of hydrogen.

My personal overall evaluation of the submitted publications is that they are equivalent to a monographic work, presenting the candidate as a skilled experimenter and analyst scientist, with interests in diverse and attractive research.

V. Citing of the publications.

Forty-six citations in Scopus-referenced scientific publications – exceeds the requirements and shows good recognition and relevance of the candidate's scientific fields of work and interests.

VI. Critics and suggestions to the candidate.

I have no critical remarks to the candidate. I recommend to continue working on various scientific topics related to experimental research, by trying to include model (simulation) research too, and to continue with all kind of pedagogical activity.

VIII. Overall evaluation.

My general evaluation of the scientific activities of assistant prof. Biliانا Georgieva is definitely positive. Based on the analysis of the presented documents, it is clear that the applicant meets and exceeds the minimum national requirements for academic position "Associate Professor" and specific to IOMT-BAS requirements.

IX. Conclusion.

The applicant, namely assistant prof. Biliana Georgieva fully meets the national requirements for academic position "Associate Professor" and specific to IOMT-BAS requirements.

Thus, I declare my positive opinion and strongly recommend the members of the Scientific Jury to give Biliana Chavdarova Georgieva the academic position of "Associate Professor" in 4.2. Chemistry sciences, Physical chemistry, for the needs of IOMT-BAS, laboratory "Electron microscopy".

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