

## OPINION

on the competition for the occupation of the academic position "Associate Professor" at the Institute of organic chemistry with Centre of phytochemistry, Bulgarian Academy of Sciences in the field of chemical sciences, code 4.2 Scientific speciality "Organic chemistry" declared in the State Gazette, issue 27/05.04.2022

by Dr. Lyudmila Georgieva Velkova - associate professor at the Institute of Organic Chemistry with the Center for Phytochemistry - BAS, member of a scientific jury, appointed by order № ПД-09-77/01.06.2022 of the Director of IOCCP-BAS

### **1. General presentation of the materials received under the procedure.**

In the competition for the academic position of "Associate Professor" for the needs of the "Chemistry of solid fuels" laboratory at the Institute of Organic Chemistry with the Center for Phytochemistry - BAS, announced in the State Gazette, issue 27/05.04.2022, the only candidate participating is Ch. Assistant Professor Ivanka Georgieva Stoycheva, Ph.D. To participate in the competition, the candidate has submitted a full set of documents in accordance with the requirements of the Regulations for the Implementation of the Academic Staff Development Act in the Republic of Bulgaria and the Regulations for obtaining academic degrees and holding academic positions at IOCCP-BAS. The documents are clearly presented in an overview and provide comprehensive information about the research activity of Dr. Ivanka Georgieva Stoycheva. The attached documents show that the candidate fully meets the minimum national requirements and meets the criteria of IOCCP-BAS for the academic position of "Associate Professor".

### **2. Biographical reference.**

Ch. Assistant Professor Ivanka Georgieva Stoycheva, Ph.D., received her bachelor's degree in "Engineering Ecology and Environmental Protection" in 2012, and in 2013 she graduated from the master's program "Natural and Synthetic Fuels" at the University of Chemical Technology and Metallurgy, Sofia. In 2013, she joined the laboratory "Technology of natural and synthetic fuels" at the Institute of Organic Chemistry with the Center for Phytochemistry at the Bulgarian Academy of Sciences, and in 2016 she successfully defended her doctoral dissertation on the topic "Synthesis of carbon based materials of organic compounds". From September 2019 until the present, she holds the position of Chief Assistant Professor in the laboratory "Chemistry of Solid Fuels" at IOCCP-BAS.

### **3. Evaluation of the candidate's scientific and applied scientific activity.**

Dr. Ivanka Stoycheva is a co-author of 35 research publications, and 25 of them are not included in her Ph.D. thesis. The total number of independent citations for all published scientific works of the candidate reflected in the scientific database Scopus are 88. She has participated in a total of 12 projects, of which 4 are with National funding, 8 international projects - 2 of them with European funding. In addition, Dr. Stoycheva is the head of two successfully completed projects: one project for young scientists and postdoctoral fellows, financed by the Bulgarian National Science Fund' 2019 and one project under the National Program "Young scientists and postdoctoral fellows" (2018-2021), financed by the Ministry of Education and Science.

Ch. Associate Professor Ivanka Stoycheva participated in the competition as a co-author of 20 scientific publications, 6 of them were included in the extended habilitation certificate (section B), and 14 were included in section G. All presented publications are in the field of organic chemistry, more specifically, technology of natural and synthetic fuels. The conducted research is complex and

in-depth, aimed at the development of methods for the conversion of mixed industrial waste into useful products, and for this purpose, both classical and state-of-the-art methods were used to isolate and characterize the potential precursors and the products obtained from their conversion.

All studies presented in section B have been published in journals, referenced and indexed in Web of Science and Scopus. The distribution of articles according to journal rank expressed in quartiles (Q-factor) is as follows: Q1–1 publication; Q2–2 publications; Q3–1 publication; and Q4–2 publications. The contribution of the candidate in these studies is undoubted, which is also supported by the fact that in 5 of the publications, Dr. Stoicheva is the first author, and in three of them she is the corresponding author. The distribution of the remaining 14 scientific papers, outside the habilitation thesis, included in the indicator G, according to the respective Q factors is as follows: Q1 - 3 papers, Q2 - 4 papers, Q4 – 2 paper, 4 scientific papers in full text are without SJR or IF.

The results of the research of Dr. Stoicheva contain new and original scientific information and are presented in the following areas:

- Analysis of the chemical composition of organic waste, available in large quantities, in order to select the most suitable of them for processing into useful products.
- Development of methods for conversion of selected organic wastes to useful liquid, gas and solid products.
- Characterization of carbon materials obtained after processing.
- Determining the applicability of the obtained solid products as carbon adsorbents for water purification from toxic organic and inorganic pollutants.

In short, the main contributions in the scientific works presented by the candidate can be summarized as follows:

- A detailed analysis of the physicochemical properties of various organic wastes was made. Based on the results, the most suitable and available of them are selected for conversion into useful products. This analysis was subsequently used to establish the relationship between the properties of the precursor and the quality of its processing products. The analysis was carried out on modern equipment, a Raman spectrometer with microscope and a thermal analysis apparatus /TG, DSC, DTA/.
- Methods have been developed for thermochemical processing of the selected raw materials into useful products - gas and liquid as energy sources and porous carbon with various applications.
- The relationship between the chemical composition of the raw materials and the properties of the products obtained after their processing has been established, which allows choosing the most suitable raw materials for processing.
- The optimal conditions for the processing of various raw materials (mainly RDF fuel, agricultural, polymer waste, etc.) have been established, allowing the production of quality products. An important contribution to this is the results obtained from the Thermal Analysis Apparatus.
- A detailed analysis of the physicochemical properties of the products obtained from organic waste as a result of the thermochemical processing was made, using equipment, such as a Raman microscope with a built-in spectrometer, apparatus for the analysis of porous texture and surface, UV Vis, etc.
- The applicability of the products obtained from organic waste in different areas has been determined. It has been found that porous carbon can be successfully used as an adsorbent for the extraction of toxic pollutants from aqueous solutions, the removal of CO<sub>2</sub> from air, the support of a catalyst for the decomposition of methanol, the preparation of a composite for hydrogen storage, the preparation of a composite for use as electrodes etc. Gaseous and liquid products can be used as an

energy source. It has been found that the liquid products can also be used as a raw material for the production of carbon materials.

It is noteworthy that in the process of her professional growth, Dr. Stoycheva has developed as a thorough researcher who, in addition to fundamental research, has also scientific and applied developments of extreme importance for environmental protection. To participate in the competition, the candidate submitted 69 citations in scientific publications, which were not included in previous competitions for occupying the academic position "Chief Assistant Professor" and the procedure for occupying the degree Ph.D. According to the scientific database Scopus, the Hirsch index (h-factor) of the candidate is 5, after excluding self-citations and citations by other co-authors, which meets the criteria of the IOCCP-BAS for the academic position.

The obtained scientific results are presented by Dr. Stoycheva in 77 participations in international and national scientific forums - 23 oral presentations and 54 posters. Ch. Assistant Professor Dr. I. Stoycheva is the winner of the Award for the best presentation at the conference "Ecological products for health", Velingrad 2020 and the Certificate for 1st place in the 18th Scientific Poster Session for young scientists, students and doctoral students, University of Chemical Technology and Metallurgy 2021.

I personally know Dr. Stoycheva and we have recently been conducting joint research work. I have no doubts about her scientific contributions of presented articles and her potential to develop, and lead research, which she has also demonstrated as the head of two projects.

#### **4. Critical remarks and recommendations.**

I have no critical remarks about the candidate. The documents for participation in the competition contains comprehensive information about the results achieved from Dr. Stoycheva.

#### **5. Conclusion.**

The documents and materials presented by Chief Assistant Professor Ivanka Stoycheva, Ph.D., meet all the requirements of the Act for the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the terms and conditions for acquiring academic degrees and occupying academic positions of the Bulgarian Academy of Sciences and the Regulations for the terms and conditions for acquiring academic degrees and occupying academic positions of the IOCCP-BAS, related to the procedure for occupying the academic position "Associate Professor".

Based on the materials presented in the competition and the scientific and applied scientific contributions contained in them, I confidently give my positive assessment and recommend to the Scientific Jury to prepare a report-proposal to the Scientific Council of the IOCCP at the BAS for awarding of the academic position "Associate Professor" of Ivanka Georgieva Stoycheva, Ph.D., in professional field 4.2. "Chemical Sciences", scientific specialty "Organic Chemistry".

18.08.2022

Jury member:

(Assoc. Prof. Lyudmila Velkova, PhD)