REVIEW

by Prof. George Tzvetanov Tzvetkov - Faculty of Chemistry and Pharmacy, Sofia University

on a competition for the academic position of "Assoc. Professor" for the needs of the laboratory "Chemistry of Solid Fuels", IOCCP-BAS, announced in SG no. 27/ 5.04 2022

The only candidate for participation in the announced competition has submitted documents: Ch. Assistant Professor Ivanka Georgieva Stoycheva, Ph.D, IOCCP-BAS

The documents presented by Ch. Assistant Professor Ivanka Georgieva Stoycheva are in accordance with the Law on the Application of Scientific Degrees and the Regulations for the Acquisition of Academic Degrees and for Occupying Academic Positions at IOCCP-BAS.

1. Brief biographical data about the candidate

Ch. assistant professor Ivanka Georgieva Stoycheva, PhD, obtained a master's degree (engineer) in HTMU-Sofia in 2013, majoring in "Natural and synthetic fuels". He defended his doctoral dissertation on the topic "Synthesis of carbon materials based on organic compounds" (scientific supervisor: Prof. Budinova) in 2016.

In the period 2013-2016, Dr. Stoycheva worked at IOCCP-BAS, "Chemistry of Solid Fuels" laboratory, as an Assistant Professor, and from 2016 until now, she is Chief Assistant Professor

1. Review of the candidate's research activity

Dr. Stoycheva is the author and co-author of a total of 35 scientific publications, of which 24 were published in journals with an impact factor (7 of them in journals from Q1), and 8 in journals with SJR. She has participated in a total of 77 conferences (23 oral reports and 54 poster presentations), as well as in 16 scientific projects (leader of 3 of them - 2 at the Ministry of Education and Culture and one at the Scientific Research Fund). The total number of citations on the works of Dr. Stoycheva at the time of submission of the documents is 80. The h-index indicated by the candidate is 6.

In the competition for the academic position of "Assoc. Professor", Dr. Stoycheva participated with an extended habilitation reference for her scientific contributions in 6 scientific publications (section C), 14 scientific publications were also presented (section D). All publications are in accordance with the professional direction of the competition

- 4.2 Chemical Sciences (Organic Chemistry), namely - technology of natural and synthetic fuels. In eight of the presented publications, Dr. Stoycheva is the first author, which is an undoubted sign that the candidate has made a significant contribution to the planning and conducting of the research in question. Citations on the articles participating in the current competition amount to 69.

The analysis of the scientific publications presented by Dr. Stoycheva, their echo in the specialized literature, her participation in scientific forums, her project activity indicate that Dr. Stoycheva meets the requirements for occupying the academic position of "associate professor" specified in the ZRASRB, in the Regulations for its application, as well as the criteria from the IOCCP-BAS Regulations. The performance of the different groups of indicators by points is presented in the annexes, filled out by the candidate for the criteria for the academic position of "associate professor". A comparison between the required indicators and their implementation by the candidate is presented in Table 1. It can be seen that the sum of points for indicators C-G exceeds (for E - almost twice) those indicated in the Regulations of the IOCCP for the position of "associate professor".

Table. 1. Required indicators (points) and their implementation by Dr. Stoycheva.

Group of Indicators	**Minimum requirements of IOCCP-BAS for holding the academic position "Assoc. Professor"**	**Dr. Diana Stoycheva**
A – Indicator 1	50	50
B – Indicator 2	-	-
C – Indicators 3 or 4	100	104
D – Sum of Indicators from 5 to 10	220	231
E – Indicator 11	70	138
F – Sum of Indicators from 12 to the end	-	-
G – H-index	≥5	6

3. Analysis of the main scientific contributions

Dr. Stoicheva's scientific interests are generally focused on environmental protection, which includes the conversion of organic waste from agricultural and industrial production into useful products. Their use as energy sources and as carbon adsorbents for the purification of water and air from various pollutants are also part of the candidate's scientific work. Below is a detailed analysis of the contributions in the papers referring to the group of indicators "C" and "D".

3.1. Contributions to the works included in group of indicators "C" (Habilitation reference)

The advanced habilitation reference "Conversion of organic waste to useful products" includes works with the numbers C1-C6. The scientific results of the presented works are summarized 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 waste to useful liquid, gas and solid products.

- Characterization of the carbon materials obtained after processing.

- Determining the applicability of the resulting solid products as carbon adsorbents for water purification from toxic organic and inorganic pollutants.

And more specifically: the goal of the research was the development of methods for the conversion of mixed industrial waste (provided by the waste processing plant in Dolni Bogrov) to useful products. As a result, a method was developed for the processing of mixed industrial waste from polymeric coverings for roofs (roofing PVC and bituminous tarpaulin), etc. to liquid and gaseous products (suitable for use as energy sources) and a solid product (carbon adsorbent with a developed porous structure). All research and analysis were carried out in the lab. CSF of IOCCP-BAS. The resulting carbon adsorbents have been successfully used to purify water from various pollutants.

The main scientific contributions in the Habilitation Reference can be summarized as follows:

- The main contribution of the research is the development of environmentally friendly methods for the utilization of organic waste from various industries. The application of these methods allows the conversion of industrial and household waste into useful products - efficient nanoporous carbon adsorbents and liquid and gas energy sources with high calorific value.

- A method has been developed for obtaining carbon foam with a developed and comparatively ordered porous structure and high mechanical strength, as during its preparation avoids the use of pressure and additional stabilization treatment. The new method makes the synthesis process much more cost-effective.

- A very detailed physicochemical characterization was made and the chemical nature of the surface of the obtained carbon materials, which plays an essential role in their various applications. The influence of thermochemical treatment conditions on the content of various oxygen-containing functional groups on the surface of the end products.

- Additional contribution of the conducted research related to the protection of environment, is the application of the obtained adsorbents in the purification of water from various toxic pollutants (phenols, dyes, heavy metals).

3.2. Contributions to the works included in group of indicators "D" (publications outside the Habilitation Report)

The main scientific contributions in these studies can be summarized to those already presented in 3.1. This, of course, is not surprising, since group D publications are part of fundamental and applied research on the synthesis of various valuable materials from various organic raw materials, carried out in the lab. CSF of IOCCP-BAS. Briefly, waste organic raw materials such as polymers [D9, D10, D12, D14], biomass [D6, D8, D9, D13, D14], coal [D13], shale [D7] have been used as precursors for the synthesis and application of the newly obtained carbon materials for water purification, in the storage of hydrogen for fuel [D4, D5, D9, D11], as catalyst carriers in various reactions [D3, D8], obtaining composites with high hardness [D2], etc.

It should also be noted the prospects for scientific research in the next 3 years, which Dr. Stoycheva sees in front of her. They can be considered as a logical continuation and deepening of the successes achieved by the candidate up to this point in the field of conversion of organic waste into useful products. I have no doubt that these future endeavors will be fruitful and interesting.

4.Critical remarks and recommendations to the scientific works of the candidate

I have no critical remarks to the materials presented by Dr. Stoycheva.

Conclusion

Based on everything said above, Ch. Assistant Professor Ivanka Georgieva Stoycheva, Ph.D., can without a doubt be defined as a hardworking researcher with

authority in the field of porous carbon materials. Her scientific asset covers, and in some cases exceeds, the requirements for holding the academic position "Associate Professor" at IOCCP-BAS. This gives me reason to confidently recommend Ch. Assistant Professor Ivanka Georgieva Stoycheva, PhD, to be elected to the academic position of Associate Professor in professional direction 4.2 Chemical Sciences (Organic Chemistry).

18.08.2022, Sofia

Reviewer:

Prof. G. Tzvetkov