STATEMENT

by Assoc. Prof. Dr. Miroslav Angelov Rangelov,
Institute of Organic Chemistry with Centre of Phytochemistry,
Bulgarian Academy of Sciences
based on the materials submitted for participation in the competition for the academic position of "Professor" in the professional field 4.2. Chemical sciences, scientific specialty "Organic Chemistry" for the needs of the laboratory "Chemistry of Solid Fuels" at the Institute of Organic Chemistry with Centre of Phytochemistry announced in the State Gazette No. 40 of 31.05.2022.

In the competition for the academic position "Professor", announced in the State Gazette No.40 of 31.05.2022 for the needs of the Laboratory "Chemistry of Solid Fuels", Institute of Organic Chemistry with Centre of Phytochemistry (IOCCP), Bulgarian Academy of Sciences, participated only one candidate: Assoc. Prof. Dr. Boyko Georgiev Tsyntsarski.

1. General presentation of the materials received and of the applicant

To participate in the competition for the academic position of Professor, the candidate has submitted a complete set of documents that meets and exceeds the requirements of the Law for the Development of Academic Staff in the Republic of Bulgaria and the Regulations on the Conditions and Procedure for the Acquisition of Scientific Degrees and the Occupation of Academic Positions in the Bulgarian Academy of Sciences and the Institute of Organic Chemistry with the Centre of Phytochemistry.

Boyko Tsyntsarski graduated in 1996 as a Master of Science in Inorganic and Analytical Chemistry at the Faculty of Chemistry, St. Kliment Ohridski University, where he defended his thesis on "Synthesis of Rb-doped YBaCuO films".

Dr. Tsyntsarski's creative career began in January 1998 when he joined the Institute of General and Inorganic Chemistry (IGIC-BAS) as a chemist. In 2003, he began working in the same position at the IOCCP-BAS, where he subsequently held the positions of Assistant Professor (2006) and Senior Assistant Professor (2008).

In 2006, he defended his PhD thesis in Chemical Kinetics and Catalysis on "Selective Catalytic Reduction of Hydrocarbons on Co-ZSM-5. IR spectroscopic study of the mechanism of the process" at the Institute of General and Inorganic Chemistry, BAS under the supervision of Prof. Dr. Konstantin Hadzhiivanov.

He holds the position of Associate Professor in the Laboratory of Solid Fuels Chemistry, IOCCP from December 2013 until the present moment.

Dr. Tsyntsarski is a co-author of 102 scientific publications, 86 of them with impact factor and one book chapter. 13 scientific publications are in journals without impact factor but with SJR. 98 of the publications are indexed in the world databases Scopus and Web of Science.

Dr. Tsyntsarski has presented his scientific results at 85 scientific forums. He has been a postdoctoral fellow at the Centre for Polymer and Carbon Materials (Polish Academy of Sciences), Zabrze, Poland. There are more than 1090 citations of Dr. Tsyntsarski's scientific work (according to Scopus, excluding self-citations). The candidate's H-index is 17 (according to Scopus, excluding self-citations).

According to the quartiles in which the Journal Citation Reports (JCR) of Web of Science groups scientific journals with an impact factor (IF), the distribution of published scientific papers for the competition by the respective quartiles (Q factors) is :

5 articles from the "B" indicator group (2 Q1 articles, 2 Q2 articles, 1 Q4 article)

12 articles in indicator group 'D' (6 articles Q1 and 6 articles Q2).

Dr. Tsyntsarski's scientific activity is also evident from his participation in number of projects funded by national and international sources Dr. Tsyntsarski participated in 11 projects with national funding, in 2 of them he was the leader, and in 3 projects from the Program for Support of Young Scientists and Postdoctoral Fellows of the Ministry of Education and Science he was a consultant. He also participated in 9 international research projects, 3 of which are funded by the EU Operational Programmes, and in 6 projects developed as international cooperation within the framework of Inter-Academy Contracts and Agreements he is the leader.

To indicator D in the competition, Dr. Tsyntsarski used 4 participations in projects with national funding, 1 participation in a project funded by EU Operational Programmes, and as a leader 1 project with national funding, and 2 international collaborations projects under Inter-Academy Contracts and Agreements (EBA). In group F of the indicators in the competition, Dr. Tsyntsarski used 12.5 points of the funds attracted from the projects he led.

2. General description of the applicant's activities

The main contributions of Dr. Tsyntsarski's research are related to the topic of the competition and are in the following three main areas:

(i) Development of methods for synthesis of new carbon materials based on different raw materials. Preparation of carbon materials by thermochemical treatment, pyrolysis, carbonization, activation. Detailed characterization of precursors and final carbon products; (ii) Study of the influence of various factors on the synthesis process of carbon materials; (iii) Application for nanoporous carbon materials as catalysts, adsorbents for water and air purification, composites for hydrogen production and storage, etc. Environmental problems.

Most of the papers featuring Dr. Tsyntsarski study all three areas.

A large group of research has been focused on the application of nanoporous carbon materials as catalysts, composites for hydrogen production and storage, and also as adsorbents for water and air purification.

Methods for the preparation of new carbon materials have been developed and factors influencing their synthesis processes have been investigated. The methods are based on different techniques to obtain carbonaceous materials from different natural raw materials and waste products such as waste biomass from different industries. Both the precursors and the final carbon products are characterized in detail.

A new technology for the conversion of waste biomass is developed, which relys on the production of biodiesel from oil-producing algae in photobioreactors to gas, liquid products and porous carbon.

For the first time, carbon adsorbents with a developed porous structure and an alkaline surface character were obtained by high-temperature hydropyrolysis of natural asphaltites. The carbon adsorbents thus obtained have shown good adsorption properties despite their high ash and sulfur contents.

The influence of various factors on the synthesis processes of carbonaceous materials has been considered in the studies carried out. It was found that carbonization of raw materials in the presence of water vapor significantly reduces energy consumption, allows the production of high quality activated carbon, increases the yield and improves the composition of liquid and gaseous products, and the resulting materials have high specific surface area and micro/meso porous texture.

A separate group of research has been concentrated on the application of nanoporous carbon materials as catalysts, composites for hydrogen production and storage, and also as adsorbents for water and air purification.

Activated carbons from various feedstocks have been used as support in the preparation of catalysts for methanol decomposition and the production of hydrogen as an alternative fuel. A promising cobalt catalyst on a support of activated carbons with different structural and chemical characteristics, that has been derived from waste biomass and low rank coal, has been shown to decompose methanol to H_2 and CO at relatively low temperatures and high selectivity.

Activated carbon suitable for the reversible absorption of CO_2 from gases was synthesized from coal tar and furfural. It has been demonstrated that the regenerated carbon can be used in successive adsorption-desorption cycles without significant loss of capacity.

Activated carbon derived from polyolefin wax, a waste product of low-pressure polyethylene production, was used as a component in a magnesium-carbon composite for reversible hydrogen storage. More than 78 wt% of the theoretical adsorption capacity was achieved, and even after 80 hydrogenation-dehydrogenation cycles, the hydrogen absorption capacity remained high.

The application of epoxy resin and carbon foam composites as constitutive materials has been investigated. The resulting composites have improved thermomechanical and tribological properties (reduced coefficient of friction) as well as relatively low density compared to previously produced carbon-polymer composites.

The capabilities of the obtained materials as absorbents of organic pollutants and heavy metal pollutants in water have been investigated.

The last part of the report of the scientific contributions of Dr. Tsyntsarski is devoted to plans for future research. These plans foresee the continuation and deepening of research in the areas presented in the scientific report and also the extension of investigating materials for battery electrodes and materials for the absorption of bacteria and viruses.

Conclusion

The overall scientific activity of the candidate is in the field of carbon materials, which fully coincides with the field and professional direction of the announced competition. The publications submitted by the candidate are relevant to the topic of the competition, represent original scientific developments with a significant contribution to the field of carbon-based materials, catalysts and absorbents and are innovative in nature.

As a result of the foregoing, I am convinced that with his scientific research activities Assoc. Prof. Dr. Boyko Georgiev Tsyntsarski fully meets all the requirements of the Law for holding the academic position of "Professor", in connection with which I propose that he will be elected "Professor" in the professional field 4.2. Chemical sciences,

scientific specialty "Organic Chemistry" for the needs of the laboratory "Chemistry of Solid Fuels" at the Institute of Organic Chemistry with the centre of Phytochemistry-BAS.

Miroslav Rangelov

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Sofia,
27.09.2022

/ Assoc. Prof. Miroslav Rangelov/