

## REPORT

**from Prof. Dr. Radostina Konstantinova Stoyanova – Institute of General and Inorganic Chemistry (BAS)**

of the documents submitted for participation in the competition  
for the academic position 'Professor'

**at Institute of Organic Chemistry with Centre on Phytochemistry (IOCCP), BAS**  
professional field 4.2. Chemical Sciences  
research specialty „Organic Chemistry“

In the competition for 'professor', announced in ДБ No 40, 31.05.2022 and on the website of the IOCCP-BAS, as a candidate, Assoc. Dr. Boyko Tsintsarski from the Laboratory CSF at the IOCCP-BAS participated.

### **1. General presentation of the procedure and the candidate**

In the competition for professor on organic chemistry, Dr. Tsintsarski participated with 5 scientific publications devoted to the synthesis and characterization of non-graphitized carbon materials. Two of these publications were published in the international journal Fuel Processing Technology, from the first quartile in the field of fuel chemistry and technology (i.e. Q1), two were in international journals of the quartile Q2, and one - in the Bulgarian journal Bulgarian Chemical Communications (quartile Q4). In accordance with the requirements of IOCCP-BAS, Dr. Tsintsarski has also submitted a habilitation report summarizing the results of its research on carbon materials. Along with the above publications and habilitation report, Dr. Tsintsarski presents 12 scientific papers, which are focused on various application of carbon materials. All publications are in journals with an impact factor, with half of them in journals classified as Q1 and the other half in Q2. From the deposited documents, I think that 110 independent citations have been noticed so far on the candidate's publications for the competition. Dr. Tsintsarski has participated in a total of eight projects financed by various programs (such as NSF, MES, and EC Horizon 2020 Program), as a result of which additional funds were attracted to IOCCP-BAS.

The above report revealed that Dr. Tsintsarski's scientific output (consisting of a total of 18 publications and 110 citations on them, as well as the participation in projects and the attracted funds) coincides with the subject of the competition and fulfills the minimal national requirements for the academic position "Professor" in the field of "Natural Sciences, Mathematics and Informatics", Chemical Sciences, specified in the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Application and the Regulations for the Terms and Conditions for Acquiring Scientific Degrees and Holding Academic positions in IOCCP-BAS.

### **2. General features of the candidate's activity**

**2.1. Main research contributions presented in the habilitation report.** The synthesis of non-graphitized carbon materials with desired texture and microstructure is a challenging scientific task in terms of understanding the thermochemical processes occurring during the formation of the carbon matrix. Dr. Tsintsarski's research covers this scientific topic. Through varying the type of precursor (from waste algae in biodiesel production, via polymers to low-rank

coal), the method of chemical or physical activation and the temperature treatment regime, carbon materials with a developed porous structure and rich in alkaline functional groups were obtained. These materials display good adsorption properties and have potential for application as adsorbents for the extraction of mercury from waste water

**2.2. Scientific contributions outside the habilitation penopm:** these studies are directed towards the application of non-graphitized carbon materials in various fields for environmental protection and hydrogen energy. In general, the research aims to understand the relationships between the synthetic methods, the structure of the carbon matrix and the corresponding properties. It has been established that activated carbons derived from coal tar and furfural exhibit good CO<sub>2</sub> storage capacity. Moreover, the adsorption properties of activated carbons remain nearly the same after their regeneration. Among the activated carbons obtained from the pits of peaches, olives and apricots, those derived from apricot pits are characterized with the highest CO<sub>2</sub> adsorption capacity. The adsorption capacity of activated carbons is determined by their porous structure and the chemical nature of their surface. It has been demonstrated that activated carbons obtained from mixtures between coal tar and furfural are characterized by good adsorption properties with respect to phenol. The addition of activated carbons (derived from polymers) to magnesium materials results in improved hydration and dehydration kinetics. Activated carbons have been used as catalyst supports for the methanol decomposition reaction and hydrogen production as alternative fuels. Based on carbon materials, it has been prepared composites for construction materials that have potential applications in medicine, aviation technology, etc.

All the candidate's research was carried out in a wide team of scientists from the same Institute, as well as scientists from other institutes of the BAS (IGIC-BAS, IC-BAS), UCTM-Sofia, the University of Naples (Italy), the National Institute of Carbon (Spain), Istanbul Technical University (Turkey). The role of Dr. Tsintsarski consists in the synthesis of carbon materials and their characterization.

### **3. Critical remarks and recommendations**

Based on the above review, several directions can be outlined in which the candidate could deepen his research. The gained rich experience would allow the candidate to define new correlations between the used precursor and the microstructure of the carbon matrix, which would enable a rational selection of carbon materials for a given application.

### **CONCLUSION**

The research of Dr. Tsintsarski contributes mainly to the knowledge expansion on non-graphitized carbon materials and their adsorption properties and applications. Based on the fulfilled minimal national requirements, I propose to the Scientific Jury to award Dr. Boyko Tsintsarski the academic position of "Professor" in Organic Chemistry at the Institute of Organic Chemistry with Centre on Phytochemistry at the BAS.

30.09.2022

**Report prepared from:** .....

Prof. Dr. Radostina Stoyanova