Attitude of reviewer

by assoc. prof. Peter Tzvetkov, PhD
on a competition for the academic position of Associate Professor in a professional field 4.2. Chemical sciences (Organic chemistry) for the needs of the laboratory "Chemistry of solid fuels", IOCCP-BAS

This opinion was prepared on the basis of order No. RD-09-77/01.06.2022 of the Director of IOCCP-BAS, issued following a decision of the Supervisory Board of IOCCP-BAS with protocol No. 9/12.05.2022, in connection with the announced competition for election of an associate professor in the State Gazette no. 27/05.04.2022. The only candidate for participation in the competition who submitted documents is Assist. Prof. Dr. Ivanka Georgieva Stoycheva, employee at the IOCCP-BAS.

Assist. Prof. Dr. Ivanka Stoycheva graduated from higher education with a master's degree at the University of Chemical Technology and Metallurgy, Sofia, majoring in "Natural and Synthetic Fuels" in 2013. Immediately after that, she began full-time doctoral studies at the IOCCP-BAS, laboratory "Chemistry of solid fuels" with scientific supervisor Prof. Temenuzhka Budinova, where in 2016 she defended her dissertation on the topic "Synthesis of carbon materials based on organic compounds". In the same laboratory, she was appointed as an assistant in the period 2016 - 2019, and from 2019 to today she holds the position of assistant professor at the IOCCP-BAS. The main scientific and research topics of Dr. Ivanka Stoycheva are the preparation and characterization of activated carbon and carbon foam from various precursors, with an emphasis on industrial waste of different origins, RDF and biomass. Raman and infrared spectroscopy, thermal analysis, X-ray powder diffraction, nitrogen physisorption, Boehm's method, iodine and mercury adsorption, etc. were used as the main characterization methods. All research has been approached methodically, with detailed characterization of the precursors and the resulting carbon materials. The strong ecological orientation of the research is striking, the goal of which, in addition to the conversion of various wastes into useful carbon adsorbents, is also their subsequent use for the purification of industrial waters from heavy metals, phenols and dyes.

The scientific results with which Assist. Prof. Dr. Ivanka Stoycheva participated in the announced competition for the academic position of "associate professor", were described in 20 scientific publications, 16 of which in journals with an ISI "impact factor", 10 of which fall into journals with rank Q1 and Q2. The observed citations to date are a total of 69. The scientific results have been developed as a participation in 4 national projects, 8 international and 2 national projects headed by Dr. Ivanka

Stoycheva. The total number of participations in scientific forums is 60. Publications, citations and participation in conferences and projects submitted for the competition exceed the required points, corresponding to the minimum national criteria, reflected in the Law on the Development of the Academic Staff in the Republic of Bulgaria, as well as in the Regulations of IOCCP-BAS.

In the habilitation report of Dr. Ivanka Stoycheva, a total of six articles are included. In three of them, the preparation of carbon foam from different precursors and their possible application for water purification from different pollutants were investigated: heavy metals (Ni^{2+} ions), iodine and methylamine. The obtained carbon materials were characterized in details, clarifying the influence of the used precursors (furfural and tar derived from RDF) and oxidizer (nitric or sulfuric acid) on the physicochemical characteristics of the resulting carbon foam. In all cases, a simplified and efficient method for foaming, developed in the "Chemistry of Solid Fuels" laboratory, was used. The methodology is presented in detail in one of the articles, and its capabilities are demonstrated on mixtures of precursors with different ratios of coal tar and furfural, and the use of sulfuric and nitric acid as oxidants. In the other three articles included in the habilitation reference, results of preparation and characterization of activated nanoporous carbon from different precursors (phenol-formaldehyde and polyolefin or RDF from polymer waste) are presented. The obtained adsorbents have shown good results in the tests for the purification of waters containing phenol derivatives and various types of dyes.

Outside the habilitation report, the scientific activity of Dr. Ivanka Stoycheva shows intense academic cooperation with international partners, other BAS institutes and universities. From the 14 scientific publications presented in the competition in refereed journals according to indicators in group D, a wider range of application were explored for carbon adsorbents, mainly obtained from waste (apricot and peach pits, algae for biodiesel production, chicken manure, polyolefin resin, RDF, etc.). This includes the use of activated carbon as an additive to magnesium hydride to store hydrogen, a carrier of catalysts for the decomposition of methanol, its inclusion in polymer membranes to purify water from nickel, mercury, phenol and other pollutants.

The scientific contributions of Assist. Prof. Dr. Ivanka Stoycheva in the presented publications is unquestionable. They are related to the development of ecological methods for the processing of industrial waste and RDF to carbon adsorbents with good performance, obtaining carbon foam using a simplified methodology with the possibility of controlling the size and distribution of pores, detailed physicochemical characterization and clarification of the chemical nature of the surface of the resulting carbonaceous materials. The research conducted on water purification from the toxic pollutants listed above in the text also has significant practical value.

In conclusion, the documents and materials submitted by the candidate fully comply with the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the relevant Regulations of the IOCCP-BAS. I confidently give a positive assessment of the works and activities presented in the competition, and I recommend the members of the Scientific Jury to prepare a proposal to the Scientific Council of the IOCCP-BAS for the election of assist. prof. Dr. Ivanka Stoycheva on the academic position "associate professor" at IOCCP-BAS, professional direction 4.2. Chemical Sciences (Organic Chemistry).

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Assoc. Prof. Dr. Peter Tzvetkov