

ATTITUDE OF REVIEWER

by Assoc. Prof. Dr. Paunka Stoyanova Novachka,
Institute of General and Inorganic Chemistry (IGIC- BAS)
Member of the Scientific Jury, appointed according to the Order № ПД-09-102/27.06.2022 by the
Director of IGIC-BAS

with respect to the materials, submitted for participation in the competition for occupying the academic position of "Professor" at the Institute of General and Inorganic Chemistry in the professional field 4.2. Chemical Sciences (Chemical Kinetics and Catalysis) for the needs of the Laboratory "Materials and Processes for Environmental Protection", announced in the State Gazette, issue No 34/03.05. 2022

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

Assoc. Prof. Dr. Ivanka Spasova from the Institute of General and Inorganic Chemistry, BAS, is the only candidate in the competition for the academic position "Professor" in the professional field 4.2. Chemical Sciences (Chemical Kinetics and Catalysis) for the needs of Laboratory of Materials and Processes for Environmental Protection at IGIC-BAS. The set of documents submitted by Assoc. Prof. Ivanka Spasova is in accordance with the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations on the Terms and Procedures for the Acquisition of Scientific Degrees and for Occupation of Academic Positions in IGIC - BAS and it comprises all required documents.

The educational and scientific profile of the candidate is fully in line with the objectives of the competition. Assoc. Prof. Ivanka Spasova graduated in the year 1983 the University of Chemical Technology and Metallurgy, Sofia, in the specialty "Technology of Organic Synthesis and Fuels". In 1998 she successfully defended her dissertation at IGIC – BAS on the topic "Synthesis and catalytic activity of oxide catalysts based on 3d-transition metals for the disposal of CO and NO at low temperatures". In 2012 she received the academic position of Associate Professor. The acquired broad knowledge in the field of chemical kinetics and catalysis is the basis for its successful realization in the Laboratory "Materials and Processes for Environmental Protection" at the IGIC-BAS.

Assoc. Prof. Ivanka Spasova has presented 33 scientific papers for participation in the competition, which are not included in her PhD thesis and in the competition for the academic position "Associate Professor". All 33 submitted publications are accepted for evaluation, 8 are according to indicator B, 25 are according to indicator G. The distribution of the journals in which the scientific papers for participation in the competition on the respective quartiles (Q factors) are published is as follows: Q1 – 14, Q2 – 13, Q3 – 4, Q4 – 2. All 33 scientific papers presented were published in journals with an impact factor (Scopus and Web of Science). 256 citations have been observed on the post-habilitation publications.

Assoc. Prof. Spasova's entire scientific activity is summarized in 71 research articles with her participation, of which 56 are published in journals with impact factor. The papers have been cited more than 586 times and the candidate has a Hirsch index (H) of 12.

Results of the scientific activity carried out with the participation of Assoc. Prof. Spasova have been presented at 79 national and international scientific forums. The candidate in the competition, Dr. Spasova participated in 16 projects with national funding and 1 international project. Assoc. Prof. Spasova is the co-supervisor of a successfully defended doctoral dissertation in 2018. Dr. Spasova's expert activity includes participation in many scientific juries and submission of a total of 14 reviewer's opinions and attitudes on materials for acquiring scientific degrees or occupying academic positions. Assoc. Prof. Spasova is the Deputy Chairman of the Scientific Council of the IGIC. She was also a member of the Temporary Scientific Expert Committees for Chemical Sciences at the Scientific Research Fund in the period 2019-2020.

2. General characteristics of the applicant's activities

The habilitation report of Assoc. Prof. Spasova is based on the results of 8 scientific publications that reveal a clearly defined research topic. These articles concern the synthesis of new catalytic materials with high efficiency, selectivity and stability and their catalytic behavior in processes of oxidation of CO and CH₄, disposal of nitrogen oxides - reduction of NO with reducing agents CO and CH₄ and decomposition of NO_x. Catalyst development is based on knowledge of the relationships between composition, structure, physicochemical properties and catalytic action. Very important is the development of multicomponent catalysts, where the possible synergistic catalytic effect, both between the different active components and between them and the carrier, has been consciously sought.

The main scientific contributions of Assoc. Prof. Spasova from these papers can be summarized in the following areas:

- Studies on catalysts based on transition metals and/or rare earth elements applied to individual supports.

A new approach has been proposed to reduce the concentration of nitrogen oxides in waste gases, consisting in integrated disposal, in which the products of the catalytic decomposition of methanol are used as reducers of nitrogen oxides. This method is of potential importance for the application of decomposed methanol (CO and H₂) as an alternative fuel in cars, simultaneously removing toxic NO_x emissions. Copper catalysts supported on mesoporous silicas obtained by impregnation and a combined method of impregnation and gas phase deposition were developed. Manganese and copper-cobalt spinel catalysts modified with additions of oxides of rare earth elements (Ln = La, Ce, Nd and Gd) deposited on Al₂O₃ were also investigated.

- Research on catalysts based on transition metals applied to composite (hybrid) supports.

Catalysts on mesoporous composite materials (SiO₂-C, Al₂O₃-C) were obtained and studied, which represent the combination of hydrophilic and hydrophobic components and provide various tools for modification and change of the chemical and physical properties of the materials in order to improve the catalytic efficiency of the catalyst, received on it. Copper oxide catalysts supported on two types of silicate-carbon composites were synthesized: with disordered and ordered porous structure. The addition of carbon in both types of composites increases the activity of the supported catalysts in the reduction of NO with CO. Carbon playing the role of both carrier and reactant. Copper oxide catalysts were also developed, deposited on templated structured mesoporous Al₂O₃-C composites used for the reduction of NO with CO. An

interesting fact is that the activity of the catalysts can be adjusted by changing the composition of the composite aluminum-carbon carrier.

The author reference for the contributing of the research activity of Assoc. Prof. Spasova outside the habilitation part includes 25 publications. The main scientific contributions are aimed at elucidating the influence of the carrier or texture on the state of the active phase and the catalytic and adsorption properties of materials for environmental protection and obtaining clean energy, as well as materials with biomedical applications. The report unites materials in the following areas: research on catalysts supported on carbon-containing materials, CO₂ capture on composites, hybrids, etc. materials; adsorption and textural characteristics of materials and research on materials with biomedical applications.

CONCLUSION

The documents and materials presented by Associate Professor Dr. Ivanka Spasova answer all the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its implementation. The scientometric indicators exceed significantly the minimum specific requirements in the Rules of the IGIC-BAS for holding the academic position "Professor". The scientific achievements of Assoc. Prof. Dr. Spasova convincingly present her as an established and promising scientist, distinguished by own scientific profile in topical and important scientific area related to the design of new materials with high efficiency and selectivity with applications such as catalysts, adsorbents, drug carriers, etc. Based on the materials submitted by the candidate, I give my positive assessment of the overall scientific and research activity of Dr. Ivanka Spasova and I strongly recommend to the honorable members of the Scientific Jury and the Scientific Council of IGIC-BAS to award Associate Professor. Dr. Ivanka Spasova the academic position "Professor" in scientific direction 4.2. Chemical Sciences (Chemical Kinetics and Catalysis) " for the needs of Laboratory "Materials and Processes for Environmental Protection" at the IGIC-BAS.

Date 15.08.2022

Member of the Scientific Jury
Assoc. Prof. Dr. Paunka Novachka