

OPINION

by Assoc. Prof. Stela Ivanova Minkovska PhD, Institute of Catalysis - BAS
with respect to the competition for occupying the academic position
“Associate Professor” at the Institute of Organic Chemistry with
Centre of Phytochemistry (IOCCP) - BAS
in Higher education field 4. Natural Sciences, Mathematics and informatics,
Professional field 4.2. Chemical Sciences, Scientific specialty Organic chemistry

Assistant Professor Dr. Gloria Issa-Ivanova from the laboratory “Organic reactions on microporous materials” at IOCCP - BAS is the only candidate applying for the academic position of “Associate Professor” in the competition, announced in the “Newspaper of State”, issue 55, dated 15.07.2022 and on the website of the Institute of Organic Chemistry with the Center for Phytochemistry, IOCCP - BAS.

1. General presentation of the procedure and the candidate

The set of materials presented by Assistant Professor Dr. Gloria Said Issa-Ivanova on electronic media is in accordance with the Law for the Development of the Academic Staff of the Republic of Bulgaria (LASRB) and the regulations on the terms and conditions for acquiring scientific degrees and academic positions at the Institute of Organic Chemistry with the Center for Phytochemistry, BAS (IOCCP - BAS), and meets the criteria of IOCCP - BAS for holding the academic position of “Associate Professor”.

In 2011 Gloria Said Issa-Ivanova graduated from the master's program at Sofia University “St. Kliment Ohridski”, Faculty of Chemistry and Pharmacy, specialty: “Medical Chemistry” and was enrolled as PhD student in the specialty “Organic Chemistry” in laboratory “Organic reactions on microporous materials” of the Institute of Organic Chemistry with the Center for Phytochemistry at the BAS. She defended her PhD thesis on “Catalytic removal of toxic emissions from ethyl acetate using nano-sized multicomponent metal oxide composites” in 2014, which the candidate fulfills the minimum national requirements for the applied position (indicator group A). In the period 2015-2017, Dr. Issa held the position of assistant researcher and in 2017 she received the position of Assistant Professor.

For the participation in this competition, the candidate has submitted 19 publications, of which 7 are in Q1-ranked journals, three in Q2-ranked journals, two in Q3-ranked journals, six in a Q4-ranked journal and one in a publication with SJR without IF. All of them correspond to the theme of the competition and do not repeat those submitted for obtaining the educational and scientific degree “Doctor” (PhD). Seven of the presented scientific publications are equated to a habilitation work, which collects 127 points and fulfills the minimum national requirements for the applied position (indicator group B). The remaining 12 refereed and indexed scientific works in world-renowned databases collect a total of 220 points, with 220 required, with which the candidate fulfills the minimum national requirements for the applied position. The number of noticed citations excluding self-citations is 131 (according Scopus, H-index 9).

2. General characteristics of the applicant's activities

Dr. Issa is co-author of 46 scientific publications. In the presented habilitation work, summarizing the results of 7 publications (Q1 – 2, Q2 – 2, Q3 – 3), the significant personal contribution of the candidate in these studies and in summarizing of the results is highlighted. This is confirmed by the fact that Dr. Issa is first author in 4 and second author in 3 of the 7 papers included in group B Indicators.

Most of the results are published in top quartile journals, further evidence of the quality of Dr. Issa's research. The high level of the candidate's scientific output is also confirmed by a large number of citations: 131 (WoS or Scopus). Evidence of the research activity is the co-authorship of 11 publications in refereed international journals published during the last 3 years (2020 – 2022). The results from the research carried out with the participation of Dr. Issa have been presented at 32 scientific forums as 12 oral and 36 poster contributions. Assist Prof. Dr. Gloria Issa demonstrates active participation in the implementation of research projects in her laboratory.

Through to the good experimental training and the ability to work in a team, she is a member of the collectives of 7 projects, financed by programs of the European Union, NATO, UNESCO, the Ministry of Education and Science and the “Scientific Research” fund. She is the project leader of three projects, two under the Scientific Research Fund program for financing scientific research of young scientists and postdoctoral students, 2016-2018 and 2019-2021, and in 2020-2021 she managed a project funded from the Ministry of Education and Culture under the National Program “Young scientists and postdoctoral fellows”.

Dr. Issa's research belongs to the priority scientific area of materials science and catalysis. The received basic research results are impressive both in view of their major part as scientific and applicable nature. By creating new and efficient synthesis approaches, new nanostructured mesoporous oxides with optimal textural and surface properties have been obtained for utilization as catalysts with potential application for the production of environmentally friendly fuels.

Results have been obtained for the catalytic efficiency of manganese oxides in the decomposition of methanol to synthesis gas and the hydrolysis of bis(4-nitrophenyl) phosphate under varying temperature. Lower oxidation states of manganese have been found out to favor the easier formation of oxygen vacancies and the formation of new active sites for further degradation of bis(4-nitrophenyl) phosphate. The obtained results of the characterization of the synthesized manganese oxides show that their structural, reduction and catalytic properties can be successfully controlled by using different preparation methods. The properties of mono- and bi-component Ce-Mn oxide materials obtained by co-precipitation method and template hydrothermal synthesis with variation of the Mn/Ce ratio have been synthesized and compared. An interrelationship between the phase composition, textural, structural, and surface and oxidation-reduction properties of the binary Ce-Mn oxides and their catalytic behavior in the complete oxidation reaction of ethyl acetate has been established. It is shown that the properties of Ce-Ti binary oxides can be tuned by varying the Ce/Ti ratio and the hydrothermal treatment temperature, at a lower relative Ce/Ti ratio favoring the stabilization of highly dispersed CeO₂ particles on the oxygen vacancies in TiO₂. Thus, high specific surface area and pore volume and oxygen mobility are ensured. An increase in catalytic activity and selectivity in the reaction of decomposition of methanol to synthesis gas has been registered. The behavior of bi-component oxides in the catalytic decomposition of methanol is characterized by some features compared to mono-component oxides, which is due to the improved textural characteristics of mixed oxides and the interaction between individual oxides controlled by the Ce/Ti ratio. A similar approach has been used to obtain nanostructured mesoporous ZrO₂-TiO₂ bi-component materials with different Zr/Ti ratios. In this case, the improved textural characteristics are the reason for the increase in the catalytic activity of the bi-component materials in the complete oxidation reaction of ethyl acetate and the decomposition of methanol. The Sn-Ti binary oxides have been synthesized, the structural, textural, redox and catalytic properties of which could be successfully controlled by varying the Sn/Ti ratio and the preparation methods. Their physicochemical characterization shows a decrease in catalytic activity and selectivity in the decomposition of methanol to synthesis gas and in the complete oxidation of ethyl acetate. It

has been demonstrated for the first time that the increase in the catalytic activity of bi-component materials is related to the enhancement of their textural characteristics. All the investigated ternary composites have been shown to possess high specific surface area and pore volume, as well as high reducibility, due to facilitated electron transfer in the Cu-Zr-Ti "interface layer". The role of this "interactive layer" in catalysis is controlled by the composition of the samples and by the applied method of modification. The ternary composites, obtained by wetting, demonstrate extremely high catalytic activity, which is associated both with the improved textural characteristics and with the specific interaction of copper oxide particles with the support.

Assistant Professor Gloria Issa results represent a thorough and significant study related to the application of new and modified methods of synthesis (hydrothermal method, impregnation method, "chemisorption-hydrolysis" method), characterization with appropriate physical methods (low-temperature nitrogen physisorption, X-ray diffraction, electron microscopy, UV-, IR, Raman- and X-ray photoelectron spectroscopy, temperature-programmed reduction with hydrogen). Impressive achievement is the control of the properties of mesoporous metal oxide materials using modern approaches and their potential application as catalysts or catalytically active phase supports. Highly active nano-sized mesoporous metal oxide catalysts have been synthesized for complete oxidation reactions of volatile organic compounds (ethyl acetate) and decomposition of methanol to synthesis gas as a source of alternative environmentally friendly fuel from renewable sources.

3. Critical remarks and recommendations

I have no critical remarks about the candidate. The documents for participation in the competition are designed according to the requirements and contain comprehensive information about the results achieved and the scientific contributions of the candidate.

4. CONCLUSION

The documents and materials presented by Assistant Professor Gloria Issa-Ivanova, Ph.D., meet all the requirements of the Law for the development of the academic staff in the Republic of Bulgaria, the Regulations for the terms and conditions for acquiring academic degrees and occupying academic positions of the Bulgarian Academy of Sciences and the Regulations for the terms and conditions for acquiring academic degrees and occupying academic positions of the IOCCP-BAS, related to the procedure for occupying the academic position "Associate Professor". Based on the materials presented in the competition and the scientific and applied scientific contributions contained in them, I confidently give my positive assessment and recommend to the Scientific Jury to prepare a report-proposal to the Scientific Council of the IOCCP at the BAS for awarding of the academic position "**Associate Professor**" of **Gloria Issa-Ivanova, Ph.D.**, in professional field 4.2. "Chemical Sciences", scientific specialty "Organic Chemistry".

16.11.2022

Member of the Scientific Jury:

/Assoc. Prof. Stela Minkovska, PhD/