REPORT

on competition for associate professor
specialty 4.2. Chemical sciences (chemical kinetics and catalysis)
at the Institute of Catalysis of the Bulgarian Academy of Sciences
(IC-BAS)
announced in Official Gazette, 47, 83, 04.06.2024

Candidate: Dr. Ralitsa Boykova Mladenova (IC-BAS)

Member of the scientific jury: Prof. Dr. Radostina Konstantinova Stoyanova (Institute of General and Inorganic Chemistry - BAS)

A. Reference for fulfilment of the minimum criteria

In the competition for associate professor in chemical kinetics and catalysis Dr. Ralitsa Mladenova participated with a habilitation thesis based on 8 scientific papers on the application of electron paramagnetic resonance spectroscopy (EPR) for the study of radical reactions in biology. Publications were published in refereed chemical and food science journals and distributed by quartiles as follows: Q2 - 37.5%, Q3 - 37.5% and Q4 - 25.0%. Along with these, Dr. Mladenova presents 14 scientific papers that can be divided into two groups: six of them represent a continuation of the research on biological products and organic materials with EPR, and the remaining eight are focused on EPR characterization of catalytic materials. Twelve of these papers were published in refereed journals as follows; Q1 - 36%, Q2 - 22%, Q3 - 14% and Q4 - 14% and two of them were published in non-refereed and non-indexed in the global referencing and indexing system. Some of the research results have been presented at 15 international conferences in the period 2020-2024. Dr. Mladenova's research has found resonance in the international literature, with 64 independent citations submitted to the competition, 32% of which are on publications from her habilitation thesis. For the development of Dr. Mladenova's research activity after 2015, her participation in projects with different funding sources is important: a total of 7 funded by the National Research Fund and the Ministry of Education and Science.

The above analysis reveals that the scientific production of Dr. Mladenova is on the subject of the competition and covers the minimum national requirements for the academic position "Associate Professor" in the field of "Natural Sciences, Mathematics and Informatics", the field of Chemical Sciences, specified in the Law for the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its application and the Regulations for the conditions and procedure for the acquisition of scientific degrees and the holding of academic positions in the IC-BAS.

B. General characteristics of the candidate's research activities

B1. Main scientific contributions presented in the habilitation thesis. Dr Mladenova's research aims to investigate the antioxidant activity of some natural products using EPR spectroscopy. The method for studying antioxidant activity is based on the use of stable 2,2-diphenyl-1-picrylhydrazyl radicals (DPPH) and quantitative monitoring of their reduction by antioxidants. The concentration of radicals is measured by EPR. Bee products, fruits (rosehip seeds and goji berries) and nuts (peanuts and hazelnuts) were studied. As a result, it is shown that EPR spectroscopy can be used as a method to determine the dose of high-energy radiation required to achieve a balance between microbial decontamination and antioxidant efficiency. The studies carried out, on the one hand, contribute to the radiochemistry of natural products and, on the other hand, would enrich the knowledge of the antioxidant activity of some food products.

B2. Scientific contributions presented in works outside the habilitation thesis. The core of this research is aimed at characterizing complex catalytic systems in order to identify and determine the forms of existence of some of their components. The systems investigated include zinc oxide and titanium dioxide based photocatalysts. Treatment of the oxide systems with Ag^+ or P_2O_5 is shown to affect their structural defects, which in turn has an impact on their photocatalytic properties. Structural defects in pure and doped zirconia that are responsible for its photoluminescent properties have been investigated. The information obtained from all these studies can help to elucidate the formation processes of catalysts as well as their catalytic performance. Dr. Mladenova's research was conducted in a team with scientists from other scientific organizations, but her role was related to the application of EPR spectroscopy to the study of the specific system.

B. Recommendations for the candidate. The use of EPR spectroscopy to determine the antioxidant activity of natural products is an interesting approach which could be extended and deepened if the candidate sought to gain insight into the nature and identification of radicals. This is a challenging experimental task that is worth developing because of its potential to describe redox processes in natural products at the molecular level.

CONCLUSION

On the basis of the overall scientific and research activity, I propose the Scientific Jury to vote "FOR" the appointment of Dr. Ralitsa Mladenova to the academic position of Associate Professor in Chemical Kinetics and Catalysis.

Radostina Stoyanova

27.09.2024, Sofia