

OPINION

by prof. Iliana Borisova Nacheva, PhD - Institute of Cryobiology and Food Technologies - Agriculture Academy - member of the scientific jury, appointed by Order № RD-09-54/29.06.2024 of the Director of the Institute of Catalysis, Bulgarian Academy of Sciences, on the basis of a decision of the Scientific Council of the Institute of Catalysis (protocol № 7 of 03.07.2024)

regarding: competition for the academic position „Associate Professor " at the Institute of Catalysis - Bulgarian Academy of Sciences, in the field of higher education 4. Natural sciences, mathematics and informatics, professional field 4.2. Chemical sciences, scientific specialty „Chemical kinetics and catalysis" for the needs of the laboratory „Design and characterization of catalytic materials", thematic direction „Application of EPR spectroscopy for the study of radical processes", announced in the State Gazette № 47 / 04.06.2024

The only candidate in the announced competition is a Chief Assist. Prof. Ralitsa Boykova Mladenova, PhD from the Institute of Catalysis - BAS, who has submitted the necessary set of documents, in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB) and the Rules of Procedure for obtaining scientific degrees and for holding academic positions at the Institute of Catalysis - BAS. The materials are presented correctly, accompanied by the necessary evidence.

To participate in the competition, the candidate submits 22 scientific works, of which 20 pcs. scientific publications, published in international refereed publications with an impact factor (5 of them are in Q1, 8 in Q2, 3 in Q3 and 4 in Q4) and 2 pcs. publications that are not referenced and indexed in the global referencing and indexing system. The achieved results of the activities of Chief Assist. Prof. Mladenova, PhD have become known to the scientific community and have received recognition, expressed in the high number of citations of her publications. 64 citations of 13 scientific works are presented without self-citations of all authors. The applicant's Hirsch index (H) based on all published works included in the ISI database is 7 (*Scopus*). The author's share of Chief Assist. Prof. Mladenova, PhD in the scientific works for holding the academic position of „Associate Professor" is as follows: the lead author is in 9 of them, the second author is in 3 pcs. and in the rest the third and next.

The submitted report on the fulfillment of the national minimum requirements and the requirements of the Bulgarian Academy of Sciences and Institute of Catalysis, shows that the candidate has the required number of points and even in the groups of indicators B, G, D, this number significantly exceeds the minimum national requirements. According to group of indicators **A**, Chief Assist. Prof. Mladenova, PhD received 50 points for a defended dissertation on the topic: „EPR study of thermally generated free radicals in food". In group **B**, 8 publications are presented, which bring her 139 points, out of 100 required. In indicator group **G**, 251 points are indicated, with a minimum requirement of 220. According to indicator **D**, 128 points were achieved, significantly exceeding the required 60.

The scientific interests of Chief Assist. Prof. Mladenova, PhD defines the main directions in her scientific research activity. The prepared habilitation report corresponds to the content of the attached 8 scientific publications (*B1-B8*). They reflect the results of studies on the effect of radiation treatment with gamma rays on the radical scavenging activity (anti-radical) of some natural products and foods (bee products, fruits and nuts) conducted with the electron paramagnetic resonance (EPR) method. Some of the articles present results of additional spectrophotometric studies of total phenolic and flavonoid content, as well as results of studies conducted with high-performance liquid chromatography to confirm the effect of irradiation on the antiradical activity of the samples.

Five contributions are presented, that summarize theoretical and applied scientific achievements related to: evaluation of the effect of radiation treatment on the radical scavenging activity of natural products and foods; study of the generation of free radicals as a result of gamma irradiation, as well as its influence on the anti-radical capacity of the examined samples with the method of electron paramagnetic resonance; establishing the effectiveness of this method in determining the optimal dose of high energy radiation for the purpose of microbial decontamination, leading to an increase in antioxidant activity or no change being detected. The results obtained from these studies may be useful for finding effective, non-toxic bioactive substances used as scavengers of free radicals for application in preventive medicine.

The author reference of the main scientific contributions of the research work outside the habilitation work is made on 14 scientific publications (*G1 -G14*). Scientific contributions are thematically summarized in the following directions: 1) Analysis of the effect of gamma-irradiation on the antiradical properties of foods and organic compounds using the EPR spectroscopy method; 2) Study of free radicals and the effect of external influences such as high energy radiation, etc. for organic substances with the EPR spectroscopy method; 3) Characterization of catalytic materials with EPR spectroscopy.

Contributions to each of the three strands include important conclusions, among which the following stand out: substances with antiradical activity (AA, Cys, and DPA) added to sucrose were found to decrease the EPR response of sucrose, implying that the new mixed materials showed no - good dosimetric properties from pure sucrose; radiation treatment of almond leads to a slight decrease in its antiradical properties, which is more pronounced in the samples irradiated with 10 kGy; with the method of electronic paramagnetic resonance, important information was obtained about the type and stability of the generated paramagnetic particles in the studied samples, as a result of external influences, such as irradiation with high energy radiations, heating, etc.; with the EPR method, the effect of the method of preparation of some foods, such as pasta products, and the storage conditions on the amount of induced radicals in them was determined; with the methods of electronic paramagnetic resonance and infrared spectroscopy with Fourier transformation, no destruction of the primary structure of hyaluronic acid hydrogel was detected after irradiation with X-rays and various types of laser radiation; modification of ZnO and TiO₂ with silver ions by photofixation plays a positive role in the photocatalytic process; the use of *Mentha arvensis* leaf plant extract in the synthesis of nanosized ZnO nanoparticles leads to changes in their structure detected by EPR, which are responsible for the increased photocatalytic decolorization rate of the dye malachite green and others.

The candidate's professional appearance is also complemented by her participation in 11 research projects, of which she is the head of one, and 5 belong to the Scientific Research Fund. The participation in a significant number of projects is proof of the high value of the scientific work, as well as the skill of Chief Assist. Prof. Mladenova, PhD to work in a team for the realization of scientific and applied goals.

Conclusion

The review of the scientific output of the Chief Assist. Prof. Ralitsa Boykova Mladenova, PhD proves a wide range of scientific interests and in-depth knowledge related to the subject of the competition. The presented scientific production in terms of content of scientific achievements and scientometric indicators fully covers and even exceeds the minimum national requirements and criteria of the Institute of Catalysis - BAS Regulations for occupying the academic position of „Associate Professor”.

On the basis of acquaintance with the presented scientific publications, their importance, the scientific and applied contributions contained in them, I find it reasonable to express my **positive assessment** and to propose to the respected members of the scientific jury to award Chief Assist. Prof. Ralitsa Boykova Mladenova, PhD, the academic position „Associate Professor”, professional field 4.2. Chemical sciences, scientific specialty „Chemical kinetics and catalysis”, thematic direction „Application of EPR spectroscopy for the study of radical processes, by field of higher education 4. Natural sciences, mathematics and informatics.

Date: 26.09.2024

Member of the Scientific Jury:

/Prof. Iliana Nacheva, PhD /