

## ATTITUDE OF REVIEWER

**Prof. PhD Maria Milinova Milanova, Sofia University „St. Kl. Ohridsky“**

With respect to the materials, submitted for participation in the competition for occupying the academic position of **Professor** at the Institute of Catalysis, BAS, professional field 4.2. “Chemical Sciences”, scientific research specialty „Chemical Kinetics and Catalysis“

On the basis of Order № ПД-09-24 dated 13.05.2019 by the Director of the Institute of Catalysis (IC), BAS, I have been appointed as member of the Scientific Jury in the competition for occupying the academic position ‘professor’ in professional field 4.2. “Chemical Sciences”, scientific research specialty „Chemical Kinetics and Catalysis“, announced for the needs of IC, BAS, Laboratory „New heterogeneous catalysts for clean energy production and protection of the environment“. Assoc. Prof. PhD Sylvia Zhivova Todorova from IC, BAS is the only candidate who submitted her application documents for participation of the announced competition.

Assoc. Prof. Sylvia Todorova graduated in the year 1989 the High Chemical Technology Institute in Sofia (at present University for Chemical Technology and Metallurgy), in the specialty “Technology of polymers, textiles and leathers” acquiring the educational degree „Master of Sciences“ and the qualification „chemical engineer“. Since 1990 until 1993 she was a PhD student at IC, BAS and her scientific research supervisor was Assoc. Prof. PhD G. Kadinov, where she defended in 1999 her PhD thesis on the topic „Investigation on the adsorption and interaction of carbon monoxide and hydrogen on deposited palladium, ruthenium and cobalt using infrared spectroscopy” and she acquired the educational and scientific degree “Philosophy Doctor PhD“. In 1993 she was appointed in the position of chemist in IC, BAS, in the year 2000 she was promoted to the position of Research Fellow II degree and in 2004 Research Fellow I degree. In 2010 after participation in a competition she was elected to occupy the position of Assoc. Prof. in IC, BAS. She has altogether length of service 29 years, out of which 8 years in the academic position „Assoc. Prof.“ in IC, BAS in the specialty „Chemical Kinetics and Catalysis“.

The complete set of materials on a CD, submitted to me by Assoc. Prof. Todorova, is in accordance with the “Regulations for career development of the academic staff in IC, BAS” and it comprises all the required documents. The set includes a total of 48 scientific publications, whereupon 27 publications out of them participate in the competition, which have not been included in her PhD thesis and they have been published after occupying the academic position of „Assoc. Prof.“. One can see on the basis of the summary, included in the set of materials, that the criteria, envisaged in item 4 of the “Regulations for the conditions and order for acquiring scientific degree and occupying academic positions in IC, BAS” are completely fulfilled by Assoc. Prof. Todorova in view of all the indices and the respective necessary number of points, while in some of these indices the number of points considerably exceeds the minimal national requirements.

**The scientific research activities** of Assoc. Prof. Todorova, illustrated by her publications, comprise studies devoted to solving actual problems of the environment, caused by pollution of the air by volatile organic compounds, which have harmful effect on the living organisms, investigations in the field of heterogeneous catalysis, including elaboration of catalysts for protection of the environment. These research activities are in correspondence with the policy of the European Union directed to the protection of the environment, represented by the proposed in the year 2013 package

of measures „Clean Air“, in which measures have been outlined until 2030 to reduce the harmful emissions of volatile organic compounds.

The elaboration of new catalysts is well justified, namely looking for substitutes of the noble metals, which show a series of disadvantages such as high price, limited availability, deactivation at high temperatures; the presence of catalyst poisons in the exhaust gases also restricts the application of noble metals as catalysts. The elaborated large number of catalysts by Assoc. Prof. Todorova in the Laboratory „New heterogeneous catalysts for clean energy production and protection of the environment“ have been summarized in the list and divided into three groups, namely: (i) Deposited oxide systems as catalysts for complete oxidation of volatile organic compounds and CO; (ii) Catalysts on the basis of combinations of oxides and noble metals (Pd, Pt) for oxidation of VOCs and methane; (iii) Catalysts for fine purification of hydrogen-rich mixtures from CO. The studies were focused on elucidation of the interconnection between the catalytic activity and the state of the deposited active components i.e. the interaction between the active phases, as well as between the active phase and the support; the elucidation of the factors, influencing the dispersion degree of the active components; clarifying the distribution of the active phase upon the surface of the support; elucidation of the influence of the type of the support and the method of preparation of the catalyst.

The scientific research work is connected with collaboration within the framework of IC, as well as with other Bulgarian research organizations and international cooperation with scientists from Russia, China, India, France and Romania.

The results from the studies have been published in prestigious scientific journals and they have been reported as oral presentations in 1 national and 6 international scientific events, as well as by poster presentations at 23 international and 8 national scientific events with international participation (for the period after occupying the academic position „Assoc. Prof.“). One of the posters, included in the group, represented at national scientific events, in fact was an international scientific event (№13, Appendix 4).

The significance of the studies of Assoc. Prof. Todorova is reflected in the research works of other authors. Some 106 citations have been noticed in WoS or Scopus of her research publications, *represented for participation in the competition and published during the period 2011-2019*, 9 citations in other international journals, also 1 citation in PhD thesis has been noticed. The data have been summarized in Appendix 3.1.

In the Appendices to the materials for participation in the competition (Appendix 3) there is a list of the citations, registered after occupying the academic position of Assoc. Prof., and these are citations of her research works, published before this period.

**The educational training** activities of Assoc. Prof. Todorova include guidance of diploma theses of students, PhD thesis and mentor of 5 students' practices. Assoc. Prof. Todorova participated as a lecturer for the target group of young specialists during the project BG051PO001-3.3.06 – 0050 „Formation of highly qualified specialists in the field of contemporary materials for protection of the environment: from design to innovations“ delivering lectures on the topic „Catalysts for purification of exhaust gases of organic compounds“.

**The project activities** of Assoc. Prof. Todorova comprise her participation as member of the teams of a large number of national scientific research projects, sponsored by Bulgarian financial institutions, 6 of them, and 3 international projects. She was the leader of the Bulgarian team in international research projects for bilateral co-operations with research groups from Russia, France and India, executed after she occupied the academic position „Assoc. Prof.“.

The efficient administrative activities of Assoc. Prof. Todorova started from the period when she was Scientific Secretary, responsible for the scientific policy of IC, and later when she continued as Director of IC, leading and coordinating the scientific research activities, the innovative applications in practice, combined with her administrative activities at the Institute.

The personal qualities of Assoc. Prof. Todorova as an expert have been highly appreciated, and the proof for it is the involvement in many scientific juries, in this aspect she submitted a total of 13 reviewer's opinions and attitudes on materials for acquiring scientific degrees or occupying academic positions.

I know personally Assoc. Prof. Todorova, I estimate highly her competence in the field of chemical kinetics and catalysis. She is a scientist, capable of organizing and leading successfully scientific studies and in the position of professor she can give her contributions for the further development and well-establishment of the Institute of Catalysis as a leading research center.

### CONCLUSION

The documents and the materials, submitted by Assoc. Prof. Todorova answer all the requirements **of the Law for the Development of the Academic Staff in the Republic of Bulgaria**, the Regulations for the application of this law and the respective Regulations of IC, BAS.

A sufficient number of research publications have been presented, published after the materials, used for defending her PhD thesis and those submitted for occupying the academic position of Assoc. Prof.. The results achieved by Assoc. Prof. Todorova in her scientific research efforts **are in complete correspondence with** the specific requirements of IC, BAS, accepted in connection with the Regulations for the application of the **Law for the Development of the Academic Staff**.

I give my positive estimation and I recommend Assoc. Prof. Todorova to be appointed in the academic position of professor in IC, BAS, in the professional field 4.2. Chemical Sciences, scientific specialty „Chemical Kinetics and Catalysis“.

Date 02.07.2019

Reviewer: .....

Prof. PhD Maria Milanova