

STANDPOINT

by Assoc. Prof. Dr. Ivanka Spassova, Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences, on the materials submitted for participation in the competition for awarding the academic position "Associate Professor" in the professional field 4.2 "Chemical Sciences" (Chemical kinetics and catalysis) announced in State Gazette, issue no. 67 of 28.07.2020

In the announced by IC-BAS competition for awarding the academic position "Associate Professor" in the Lab. "New heterogeneous catalysts for clean energy and environmental protection", the only candidate is Assist. Prof. Radostina Dimitrova Palcheva, PhD. The submitted materials for participation in the competition are in compliance with the Regulations for the Terms and Procedure for Acquisition of Academic Degrees and for Occupation of Academic Positions in IC - BAS and include all necessary documents.

Brief details of the applicant

Assist. Prof. Dr. Radostina Palcheva graduated in 1999 from Sofia University "St. Kliment Ohridski" with a master's degree in Chemistry. From 2003 to 2006 she was a full-time PhD student at IC-BAS, where in 2006 she defended her doctoral dissertation. Since 2007 she has been Assistant Professor in the lab. "New heterogeneous catalysts for clean energy and environmental protection". In the period 2007-2013 she was a post-doctoral student at the University of Oslo, Norway.

Scientific research activities

Dr. Radostina Palcheva exceeds the necessary minimum requirements of BAS and IC for the academic position of "Associate Professor". She is a co-author of 25 publications (4 from the doctoral dissertation), with 20 of which she participated in the current competition. Seventeen of the publications are in journals with IF, of which 8 are in journals indexed with quartile Q1, 4 with Q2, 3 with Q3 and 2 with Q4. More than 331 citations (Scopus) were noticed on all articles, and the citations of the publications for participation in the competition were over 297 (Scopus and Web of Science). The Hirsch index of Dr. Palcheva according to Scopus is 12. The leading personal contribution of the candidate in the research and summarizing the results is confirmed by the fact that she is the first author in 10 and the second in 5 of the presented publications. Results of scientific research conducted with the participation of Assist. Prof. Dr. Radostina Palcheva, were presented at 6 national and 20 international scientific forums with 5 oral and 25 poster presentations. Dr. Palcheva has been a leader of 3 and participant in 3 bilateral projects, as well as a participant in 3 projects with the National Scientific Fund.

Scientific contributions

The habilitation report of Dr. Radostina Palcheva is presented on the results of 6 scientific publications. These publications are on the synthesis and research of catalysts for removal of sulfur-containing compounds from petroleum products. In the habilitation work, supported catalysts containing Mo (W) promoted with Ni (Co) were considered. The candidate's contributions relate to finding correlations between the chemical composition of the catalysts and the carriers, the heat treatment, the influence of the modifying additives and complexing agents and the catalytic activity of the catalysts in the hydrodesulfurization reactions of thiophene and 1-benzothiophene. Mixed oxide hydrodesulfurization catalysts prepared using heteropoly compounds as model systems were studied, and their catalytic activity was compared with the activity of industrial catalysts. The main contributions of the candidate's research are:

- Pre-modification of Al_2O_3 with Ni or Co, thermal treatment and subsequent impregnation with Co (Ni)-Mo salts leads to the production of highly active HDS catalysts due to minimizing the formation of inactive cobalt or nickel aluminate in Co (Ni) -Mo catalysts.
- The activity of nickel-molybdenum catalysts supported on unmodified and modified with Co, Ni, or B γ -

Al₂O₃ correlates with the amount of hemisorbed oxygen on the sulfide samples. The most active Ni-Mo HDS catalyst had the highest surface content of partially sulfided molybdenum.

- Ni-Mo catalysts synthesized using organic chelating complexes are investigated, and in these cases a sulfide phase containing a large amount of labile sulfur is formed after sulfidation.

- The catalytic characteristics of NiMo catalysts supported on two types of Nb-modified mesoporous silicas are sensitive to the porous structure of the supports and to the treatment method. It is found that larger pore sizes in addition to the higher surface concentration of Nb, provide better dispersion and location of the active components on the carrier, which leads to higher HDS activity.

- The conversion of thiophene on TiO₂ nanotubes supported NiW catalyst is twice as high as that of conventional Al₂O₃ or TiO₂ supported NiW catalysts, due to more W oxysulphide species interacting with Ni-sulfide particles as result of the electronic effects of TiO₂ nanotubes.

- The catalytic activity of NiMo catalysts supported on mixed Al-Zn oxides does not increase with increasing Zn/Al ratio and addition of SiO₂ in HDS of thiophene due to the formation of multilayer MoS₂ phases. When modified with SiO₂, more surface molybdate forms are formed, and after sulfidation, more active centers are formed.

The report for the contribution of Assist. Prof. Dr. Radostina Palcheva on the non-habilitation works for participation in the competition is based on 14 scientific publications. The papers include fundamental research on the influence of the type of support and active components on the catalytic activity of the synthesized materials. These works are grouped in three main directions: a) catalysts for hydrodesulfurization of thiophene and 1-benzothiophene, b) monometallic and bimetallic NiRh catalysts supported on mixed and perovskite oxides in reactions of partial oxidation of methane and methane reforming with CO₂ and c) catalysts for complete oxidation of ethanol, dehydration of glycerol and conversion of ethene to propene. The obtained results clarify the surface composition of the catalysts before and after the reaction, some types of reactive forms and help to suggest mechanisms of catalytic reactions.

CONCLUSION

The analysis of the documents and materials presented by Assist. Prof. Dr. Radostina Palcheva for participation in a competition for awarding the academic position *Associate Professor* shows that they fully meet the theme of the announced competition, as well as the requirements of the regulations for holding this academic position in the IC- BAS.

Therefore, I convincingly recommend to the members of the Scientific Jury and to the Scientific Council of IC-BAS to award to Assist. Prof. Dr. Radostina Palcheva the Academic Position "*Associate Professor*" in the field 4.2. Chemical Sciences (Chemical kinetics and catalysis).

02.11.2020

Member of the Scientific Jury:
(Assoc. Prof. Dr. Ivanka Spassova)