

STANDPOINT

by Assoc. Prof. PhD Dimitrinka Aleksieva Nikolova
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on the competition for occupying the academic position an Associate Professor in a professional field 4.2. "Chemical Sciences", scientific research specialty "Chemical kinetics and catalysis" for the needs of the Institute of Catalysis at the Bulgarian Academy of Sciences, Laboratory "New Heterogeneous Catalysts for Clean Energy Production and Environmental Protection"

The competition for "Associate Professor" in the scientific research specialty "Chemical Kinetics and Catalysis" was announced in „Newspaper of State”, issue 67 of 28 July 2020 by the Institute of Catalysis (IC) at the Bulgarian Academy of Sciences (BAS) for the Laboratory "New Heterogeneous Catalysts for Clean Energy Production and Environmental Protection". The only candidate in the competition was Assistant Professor PhD Radostina Dimitrova Palcheva. All the documents, required and specified by the “Regulations for the Conditions and Order of Appointing in Academic Positions” in the Institute of Catalysis of BAS have been fully presented. The candidate meets the minimum requirements of BAS for occupying the academic position of "Associate Professor", as well as the increased criteria of the Institute of Catalysis.

Assist. Prof. Palcheva is co-authored of 25 publications, 20 of which she participate in the competition, 17 of them being in journals with impact factor, namely 8 with the highest Q1 category, 4 in Q2, 3 in Q3 and 2 in Q4.

The significant personal contribution of Assist. Prof. Palcheva in the researches and summarizing the results is evident from the fact that she is referred to as the first author in 10 publications included in the habilitation work, and in 7 of them she is corresponding author. Scientific significance of the studies is confirmed by the international prestigious of the journals in which they were published. The rest of 5 publications are included in out-of-habilitation work. Of the total 331 citations (w/o auto citations), 292 are on the publications included in the competition. The results from these studies, performed with the participation Assist. Prof. Palcheva, have been presented at 25 international scientific forums, 3 of which are oral presentations as well as at 5 national forums.

The chronology of the professional development of Assist. Prof. Palcheva shows that in the period 2010–2012 she had was in a post-doc position at the University of Oslo, Norway, Topic "Design of oxide materials for selective catalysis". Furthermore, she had had a two-month specialization in 2014 at the Catholic University of Leuven, Belgium, the Group of Prof. E. Gaigneaux, with the topic "Physico-chemical characteristics of catalysts for energy production - SBET, XRD, TPR/TPO, XPS methods". She has been an manager of the bilateral projects between the Institute of Catalysis, BAS and the Institute of Fundamentals of Chemical Processes - Czech Academy of Sciences, Prague, and as at present.

The scientific contribution included in the *Habilitation work* of Assist. Prof. Andonova reveals clearly outlined subject of the investigations on the increasing the activity of the many studied Co or Ni promoted molybdenum and tungsten catalysts used for the production of environmentally friendly fuels with low sulfur content through the industrial process of hydrodesulfurization (HDS).

The essence of scientific contributions is consisted in studying the effect of the application of Mo or W heteropoly compounds as precursors for the production of mixed oxide catalyst systems, which flat molecular structure allows uniform distribution of components on the surface of the support. The type of oxide and sulphide structures and their influence to improve the catalytic activity are studied.

Part of the investigations is on catalysts synthesized with Co heteropolyoxomolybdate (CoMo_6) and with Ni heteropolyoxomolybdate (NiMo_6) with Al_2O_3 support. It has been clarified that the nickel or cobalt additives used to pre-modification of the alumina provide preservation of the heteropoly anion by eliminating of the formation of inactive Co or Ni aluminates.

The other scientific contributions are related to the use of organic chelating complexes (nitrioloacetic acid and thioglycolic acid) to initial NiMo solution used for impregnation. It has been found that the added chelate complexes are included in mixed structures with Ni and Mo and thus during the sulfidation process a larger number of active sulphide sites are obtained.

Improvements in the HDS activity of the NiMo system are also explored for by changing the support kind applying siliceous mesoporous SBA-15 and HMS modified with Nb. Increasing the activity of the NiMo catalyst is achieved by using SiO_2 -modified mixed Al-Zn oxide as a support. TiO_2 nanotubes have been identified as a suitable carrier for increasing of the activity of NiW system in comparison with the classical Al_2O_3 and TiO_2 .

The approaches for improving the activity of the known Mo(W) containing HDS catalysts and their comparison with commercial catalysts show the systematic work of Dr. Palcheva in this scientific field.

The rest publications presented by Assist. Prof. Palcheva *outside Habilitation work* are organized in three thematic directions: further studies on Ni(Co)-Mo(W) catalysts for hydrodesulphurization looking for new oxide support systems: CeO_2 ; modified Al_2O_3 with CeO_2 ; W, Al and Ti modified SBA-15 and HMS; the second direction represents research in also topical areas such as partial oxidation of methane on Rh deposited $\text{La}_{0.75}\text{Sr}_{0.25}(\text{Fe}_{0.8}\text{Co}_{0.2})_{1-x}\text{Ga}_x\text{O}_{3-\delta}$ oxides with perovskite structure, methane reforming on Ni deposited $\text{CeO}_2\text{-Al}_2\text{O}_3$ and $\text{Y}_2\text{O}_3\text{-Al}_2\text{O}_3$ catalysts and NiRh supported on Y-modified Al_2O_3 ; In addition, studies are performed with catalysts for complete oxidation of ethanol, dehydration of glycerol and conversion of ethene to propene as Mo and W catalysts synthesized by heteropolyacids impregnated on Al_2O_3 and SBA-15 supports, as well as the $\text{NiSO}_4/\text{Re}_2\text{O}_7/\gamma\text{-Al}_2\text{O}_3$ system. Publications outside the Habilitation work show that Dr. Palcheva has wide scientific experience.

The actuality among the scientific community of the works presented in the competition is confirmed by the number of citations and it is indisputable proof of the scientific work of

Assist. Prof. Palcheva. Assuredly, Dr. Palcheva is a researcher with abilities in the field of catalysis.

After reviewing the presented materials and based on personal impressions, I suggest with conviction of the members of the Jury and to the Scientific Council of IGIC-BAS to vote positively and to approve Assistant Professor PhD Radostina Dimitrova Palcheva for occupying the academic position of “Associate Professor” in the professional field 4.2. "Chemical Sciences", scientific research specialty "Chemical kinetics and catalysis" for the Laboratory "New Heterogeneous Catalysts for Clean Energy Production and Environmental Protection", Institute of Catalysis at the Bulgarian Academy of Sciences.

Date 16. 11. 2020

Member of the Scientific Jury:

/Assoc. Prof. PhD Dimitrinka Nikolova /