

OPINION

in a competition for selection of an "associate professor" in a professional field 4.2. "Chemical Sciences" (Chemical Kinetics and Catalysis) for the needs of the Laboratory "Materials and Processes for Environmental Protection", IGIC, BAS, announced in State Newspaper no. 47 of 4.06. 2021

Reviewer: Prof. DSc Tanya Stoyanova Tsoncheva (Hristova), Institute of Organic Chemistry with Center for Phytochemistry, Bulgarian Academy of Sciences

on the basis of Order No. RD-09-110, July 29, 2021 of the Director of IGIC, BAS

Candidate for the competition: Dr. Daniela Dimitrova Stoyanova, Assistant Professor in the laboratory "Materials and processes for environmental protection"

Professional biography of the candidate

Daniela Stoyanova was born in 1962 in Sofia. She graduated in 1993. In University of Chemical Technology and Metallurgy, Sofia, with specialties in the field of "Inorganic and electrochemical production" and "Industrial ecology". In 2002, as a PhD student, she defended her thesis on "Copper-cobalt oxide catalysts applied to lanthanum-modified aluminosilicate composites and γ - Al_2O_3 for waste gas purification." Since 1996 she has been working consecutively as a chemist and research associate at IGIC, BAS, and since 2004 she has been Assistant Professor in the lab. "Materials and processes for environmental protection" in the same institute.

Publications, citations, participation in the conference

Dr. Daniela Stoyanova is an author of 42 publications that are referenced and indexed in the global databases WEB OF SCIENCE and SCOPUS. She participates in this competition with 37 of these articles, distributed in quartile Journals as follows: Q1-5; Q2-7; Q3-6 and Q4-9. In almost half of these articles she is in first or second place in the author's team, which proves her leading position in the research and processing of the results. Dr. Stoyanova is a co-author of 1 Bulgarian patent (2003) on the synthesis of "Spinel-like catalyst for exhaust gas purification and method for its production".

The number of noticed citations on all publications of the candidate is 140. 105 of them are on 11 publications included in the competition. I would like to mention the article published in the Chemical Engineering Journal, 2015, in which 63 citations were noted.

Some of the research results are presented through poster reports at 27 national and international scientific forums at home and abroad.

The candidate's H-index, assessed by SCOPUS, is 5.

Participation in projects

Throughout the period, subject to this evaluation, Dr. Stoyanova successfully manages 4 projects under the bilateral agreement of BAS and the Serbian Academy of Sciences and Arts. She actively participates in the implementation of 4 projects funded by the Bulgarian Research Fund.

Expert activity, participation in organizations, etc.

During the period Dr. Stoyanova was a reviewer of 10 dissertations. She is a member of the Union of Chemists in Bulgaria and the Bulgarian Catalytic Society.

Habilitation Thesis

Dr. Stoyanova's habilitation thesis is dedicated to the synthesis of new, effective catalysts for air purification from carbon and nitrogen oxides emitted by transport, energy and the chemical industry. It includes 10 articles, published in Journals as follows: Q1-2; Q2-2; Q3-3 and Q4-3. The articles were published in the period 2006-2017, and almost all of them, Dr. Stoyanova is the first author. Much of the research in the habilitation thesis is related to the synthesis of cost-effective, thermally and chemically stable supports of catalysts for different application. For this purpose, natural and synthetic raw materials were used, varying both the conditions of production of ceramics and the composition of the raw material. I believe that the main contributions of research are related to:

- Establishing the conditions for the formation of the spinel phases cordierite and mullite;
- Optimization of the method for obtaining the composites in order to increase their thermal stability;
- Clarification of the determining role of thermal treatment for regulating the structure formation and crystallization of multicomponent materials;
- Research on the possibility of reuse of the catalysts supports and improving their characteristics for the preparation of catalysts through appropriate doping.

Of interest are studies related to increasing the efficiency of catalysts by successfully extracting the active ingredient and utilizing the solid residue to obtain new catalysts with increased strength and resistance to catalytic poisons. In this direction, with a strong practical focus are the studies on the synthesis of new catalysts for complete oxidation of CO and hydrocarbons in the presence of SO₂ in

the use of metallurgical slag as a raw material. No less useful for practice are the data for purification of real emissions from the production of HNO_3 in the presence of spinel-type catalysts in optimizing the method and conditions for their production.

Scientific contributions to research not included in the habilitation thesis

16 of the articles with which the candidate participates in the competition are not included in the habilitation work, but are also aimed at developing effective catalysts with ecological application such as methane combustion, CO oxidation, photocatalytic oxidation of ethylene and acetylsalicylic acid and dye decomposition. in wastewater. Part of the research is focused on obtaining corrosion-resistant oxide coatings on metals. Complex multicomponent catalysts have been synthesized, which are well characterized by a set of suitable physicochemical techniques. The following more important results can be noted:

- A stabilizing effect of CoO on PdO clusters in catalysts for complete combustion of methane has been established. A conclusion is made about the competing effect of the water released in the reaction with respect to the adsorption of methane on the active sites;
- An adverse effect of spinel formation between the active CuO and NiO in the reaction of CO oxidation has been established, which can be regulated by the method and conditions of the synthesis;
- Original synthesis methods have been developed, including hydrothermal treatment, and the conditions for obtaining efficient photocatalysts have been optimized;
- The research on corrosion coatings is very interesting and with practical potential, as the efforts are aimed at clarifying the role of the structural and surface properties of the surfaces for obtaining good coatings.

Conclusion

Dr. Daniela Stoyanova is a researcher with very good experience in the field of synthesis and characterization of catalysts and catalyst supports for various environmental applications. In her study, the combination of new and diverse methods for preparation of catalysts, the optimization of precursors and conditions for synthesis and the detailed characterization of the physicochemical properties and catalytic behaviour of obtained materials in different thermally and photocatalytically activated reactions, are the basis of significant conclusions on the possibilities for regulating the active phase and reducing the cost of catalysts by using cheaper components, natural and other sources and recycling the spent catalysts. The publishing activities of the candidate, combined with her leading role in a large part of the research provides a proof that Dr. Daniela Stoyanova is a very good experimenter and established specialist in the field of synthesis of catalysts for environmental needs. Therefore, I strongly recommend to the esteemed Scientific Council at IGIC, BA

award Dr. Daniela Stoyanova the academic position of "Associate Professor" in the professional field "Chemical Sciences", scientific specialty - Chemical Kinetics and Catalysis.

23.08.2021

Sofia

Prepared the opinion:

/Prof. DSc Tanya Tsoncheva/