OPINION

by Prof. Dr. Ivanka Spassova, Institute of General and Inorganic Chemistry- Bulgarian Academy of Sciences, on the materials submitted for participation in a concurs for holding the academic position of **Professor** in professional field 4.2 Chemical Sciences (Chemical Kinetics and Catalysis), published in the *State Gazette*, issue No. 82 of 7 October 2025.

General Presentation of the Candidate

In the competition announced by the Institute of Catalysis- BAS for acquiring the academic position of Professor in the laboratory "New Heterogeneous Catalysts for Clean Energy and Environmental Protection", the only candidate is Assoc. Prof. Dr. Dimitrinka Aleksieva Nikolova. The candidate has submitted a complete set of documents in accordance with the Law for the Development of the Academic Staff in the Republic of Bulgaria, its Implementing Regulations, and the Regulations of the Institute of Catalysis- BAS for holding academic positions.

Dimitrinka Nikolova is registered in the National Centre for Information and Documentation (NACID) (https://ras.nacid.bg/dissertation-preview/26269), where her educational and scientific degree "Doctor" and the academic position "Associate Professor" have been officially recognized.

Dimitrinka Nikolova graduated in Inorganic and Electrochemical Technologies from the University of Chemical Technology and Metallurgy- Sofia in 1995, obtaining the educational degree Master's. In 2005, she defended her doctoral thesis at the Institute of Catalysis- BAS. She has been employed at the Institute of Catalysis- BAS since 1996, where she was elected Associate Professor in 2016. Assoc. Prof. Nikolova is a member of the Management Board of the Competence Center "HITMOBIL", Chair of the Bulgarian Catalysis Society, and Secretary of the Scientific Council of the Institute of Catalysis- BAS 2019-2025.

General Characteristics of the Candidate's Research and Applied Scientific Activity

Assoc. Prof. Dr. Dimitrinka Nikolova is a co-author of 57 publications, a significant part of which are published in refereed and indexed international journals, as well as 2 book chapters and 2 patents. In the present competition, she participates with 21 publications in refereed journals, 1 book chapter, 2 patents, and 1 patent application. Ten of the publications are in journals ranked in Q1, three in Q2, two in Q3, and six in Q4. All publications by Assoc. Prof. Dr. Nikolova have received 217 citations, of which 110 citations refer to the publications submitted for this competition.

The results of the scientific research conducted with the participation of Assoc. Prof. Dr. Dimitrinka Nikolova have been presented at 14 national and 20 international scientific forums through 24 oral and 41 poster presentations.

The candidate's project activity is also extensive. Assoc. Prof. Dr. Dimitrinka Nikolova has participated in 2 international projects and 8 national research projects. She has served as the leader of the Bulgarian team in 5 international research projects and as the principal investigator of 3 national projects. A total of over BGN 1 048 150 BGN has been attracted through the projects she has led.

A report on the fulfillment of the minimum national requirements stipulated in the Law for the Development of the Academic Staff in the Republic of Bulgaria and its Implementing Regulations for holding the academic position of Professor in the scientific field Natural Sciences, Mathematics and Informatics, professional field Chemical Sciences, as well as in the Regulations of the Institute of Catalysis- BAS for the acquisition of scientific degrees and holding of academic positions, has been submitted. The total score amounts to 1615.6 points, compared to the required 640 points. The distribution by indicators is as follows: Indicator A- 50 points; Indicator B- 184 points (required 100); Indicator C- 308 points (required 220); Indicator D- 434 points (required 120); Indicator E- 639.6 points (required 150). It is evident that the scientometric indicators of Assoc. Prof. Dr. Dimitrinka Nikolova significantly exceed the requirements for holding the academic position of Professor.

Scientific and Applied Scientific Contributions

The habilitation report of Assoc. Prof. Dr. Dimitrinka Nikolova is entitled "Design, investigation, and optimization of catalysts and electrocatalysts for clean hydrogen production and green energy processes". It summarizes the results of nine scientific studies in two main research directions: (i) the development and investigation of rhenium-containing catalysts for clean hydrogen production via the CO to CO_2 water-gas shift reaction, and (ii) the development and investigation of non-noble metal electrocatalysts for green energy production through hydrogen fuel cells and green hydrogen technologies.

The research in the first direction is focused on the development of efficient low-temperature catalysts for the water-gas shift reaction (WGS), including operation in the presence of sulfur impurities. Particular emphasis is placed on oxo-rhenium systems promoted with Co, Ni, K, and Mo, supported on suitable carriers. It has been established that the key to the development of effective non-noble metal catalysts for low-temperature WGS lies in the precise tailoring of their composition and activation, ensuring an optimal redox balance, control over electronic properties, and the size of the active oxide structures. In sulfide reaction environments, the optimized rhenium catalyst formulations, especially KCoRe, demonstrate high potential as low-temperature, sulfur-resistant catalysts for efficient purification of H_2- containing gas streams and additional hydrogen production.

The publications in the second research direction address the development of energy-efficient, non-noble (PGM- free) catalysts for fuel cells and electrolysis. A major scientific and applied achievement is the development of an innovative low-temperature synthesis method for a nickel catalyst supported on a ceramic matrix of yttrium-doped barium cerate, intended for use as an anode in proton-conducting solid oxide fuel cells. The proposed approach results in improved nickel dispersion and stronger metal- support interactions, leading to a significant enhancement of electrochemical activity and anode stability compared to conventional technologies. Another substantial contribution is the experimental demonstration of the successful replacement of noble metals with PGM- free catalytic systems, applicable both in alkaline fuel cells and in water electrolysis processes. The developed materials exhibit high catalytic activity, long-term stability, and potential for industrial implementation, identifying them as promising solutions for the sustainable production and efficient utilization of hydrogen and green energy.

The author's report encompasses fundamental and applied research aimed at the development of efficient and innovative metal and metal-oxide systems, with a focus on protecting human health, improving quality of life, and their application in the energy sector. The scientific work of Assoc. Prof. Nikolova outside the habilitation thesis, reflected in a total of 12 publications, is primarily focused on the development and investigation of advanced nickel-containing catalysts, predominantly with a hydrotalcite structure. These catalytic systems are intended for hydrogenation processes of vegetable oils, as well as for technologies related to hydrogen production and purification. In addition, part of the research is devoted to the development of catalysts for wastewater treatment containing synthetic dyes, as well as to the catalytic decomposition of ozone in air purification processes.

CONCLUSION

The documents and materials submitted by Assoc. Prof. Dr. Dimitrinka Nikolova comply with all the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Implementation and the relevant Regulations of the Institute of Catalysis, BAS. A sufficient number of scientific works published after her habilitation have been presented, and the results achieved by Assoc. Prof. Dr. Dimitrinka Nikolova in her research activity fully comply with the additional requirements of the Bulgarian Academy of Sciences.

For these reasons, I confidently recommend that the members of the Scientific Jury and the Scientific Council of the Institute of Catalysis- BAS award Assoc. Prof. Dr. Dimitrinka Nikolova the academic position of Professor in professional field 4.2 Chemical Sciences (Chemical Kinetics and Catalysis).

03 February 2026 Member of the Scientific Jury:

(Prof. Dr. Ivanka Spassova)