OPINION

by Assoc. Prof. Yordanka Karakirova, PhD
Institute of Catalysis – Bulgarian Academy of Sciences

Regarding: the application of **Assoc. Prof. Nikolay Ivanov Velinov, PhD,** for the academic position of „*Professor"* in Professional Field 4.2 "Chemical Sciences", Scientific Specialty "Solid State Chemistry", for the needs of the Laboratory "Design and Characterization of Catalytic Materials" within the thematic area "Synthesis and Structure of Catalysts and Sorbents",
announced in State Gazette No. 82/07.10.2025.

I submit the present evaluation as a member of the Scientific Jury for the above-mentioned competition, in accordance with Order No. RD-09-92/09.12.2025 issued by the Director of the Institute of Catalysis – BAS. This evaluation is prepared in compliance with the requirements of the Academic Staff Development Act of the Republic of Bulgaria and the Regulations for the Conditions and Procedures for the Awarding of Scientific Degrees and Academic Positions at the Institute of Catalysis – BAS.

Assoc. Prof. Nikolay Ivanov Velinov is the **sole applicant** in the competition for the academic position of „*Professor"* at the Laboratory "Design and Characterization of Catalytic Materials", Institute of Catalysis – BAS, within the thematic area "Synthesis and Structure of Catalysts and Sorbents".

Brief biographical data

Nikolay Velinov obtained his Master's degree in Chemical Engineering from the University of Chemical Technology and Metallurgy (UCTM), Sofia, in 2001. From 2001 to 2009 he worked as a chemist at UCTM. During the period 2002–2005 he was a full-time PhD student at UCTM. In 2009 he defended his PhD dissertation entitled *"Synthesis and Investigation of Perovskite and Perovskite-Like Materials for Cathodes in Solid Oxide Fuel Cells"* and was awarded the degree "Doctor". Since June 2009 he has been working at the Institute of Catalysis – BAS, where he has held the positions of chemist, Research Fellow II degree, Chief Assistant, and currently holds the academic position of „Associate Professor" at the Laboratory "Design and Characterization of Catalytic Materials".

Description of the submitted materials

Assoc. Prof. Velinov has submitted all required documents and materials for participation in the announced competition. He is co-author of 87 scientific publications, 64 of which are in journals with impact factor or impact rank. For the purposes of the competition, 27 articles published after his appointment as Associate Professor are presented.

Nine papers in international peer-reviewed journals indexed in Web of Science/Scopus are included in the Habilitation summary, which covers scientific results published in the period 2015–2021 (Group B of the performance indicators). All papers fall within the thematic scope of the present competition and include studies on the synthesis, structural characterization, and catalytic properties of mixed ferrites containing Co, Zn, Mn, and Ni, ferrites supported on activated carbon, and oxide–nitride systems.

Among these publications, two are in Q1 journals [B1, B3], two in Q2 [B4, B6], three in Q3 [B7, B8, B9], and two in Q4 [B2, B5]. In six of them Assoc. Prof. Velinov is the first author, demonstrating his significant personal contribution.

The publications submitted for the competition have received 539 citations (excluding self-citations) out of a total of 573, all in reputable international journals.

He has participated in 77 national and international scientific events and in 28 research projects (9 international and 19 national), serving as project leader in two projects funded by the Bulgarian National Science Fund.

Assoc. Prof. Velinov has supervised one PhD dissertation and four Master's theses. His scientific and organizational activities also include his role as Chair of the Scientific Council of the Institute of Catalysis – BAS. He is a member of the International Board on the Applications of the Mössbauer Effect (IBAME), the Bulgarian EPR Society, and the Bulgarian Catalysis Society.

Field of scientific interests and contributions

Assoc. Prof. Velinov has submitted two author's statements of scientific contributions – a Habilitation extended summary (Group B) and an author's summary of contributions from publications outside the habilitation work (Group G).

The publications included in the Habilitation summary cover studies on the synthesis, structural characterization, and catalytic properties of mixed spinel Cu–M (M = Co, Zn, Mn, Ni) ferrites, as well as ferrite systems supported on activated carbon. The main focus is on the control of cation distribution, microstructure, and phase transformations through various synthesis methods (mechanochemistry, auto-combustion, sol–gel, co-precipitation), enabling control of crystallite size for the optimization of catalytic properties.

A major scientific contribution is the establishment of composition–structure–activity relationships in key reactions related to hydrogen production and environmental protection – water–gas shift reaction, methanol and dimethyl ether decomposition.

Novel catalyst supports – activated carbons derived from agricultural waste – have been introduced, and the dominant role of their textural characteristics in the formation and stability of the active phase in Cu–Mn ferrites has been demonstrated. The effect of copper content on catalytic activity has been established, and it has been shown that activated carbon promotes the formation of magnetite and carbide of Hägg in reducing reaction environments.

Mössbauer spectroscopy has been employed as a key tool to prove superparamagnetic behavior, determine cation distribution, and track phase transformations under reaction conditions, including the formation of magnetites, iron carbides, alloys, and nitrides.

In studies on the effect of gold deposition on Cu–Mn ferrites, it was demonstrated that gold does not enhance catalytic activity in WGSR, indicating that activity is governed by the structure of the material rather than the presence of a noble metal.

The results obtained in the Habilitation work are of both fundamental significance for the understanding of ferrite systems and applied relevance for the development of efficient catalytic materials.

In the author's summary of Group G, the research is organized into five main directions: Fe–Ce oxide catalysts; Fe–Hf–Ti oxide catalysts; activated-carbon-supported catalysts; ferrite catalysts; and studies of iron-containing materials. A common feature of all five directions is the systematic and consistent approach to the development of iron-containing oxide and oxide–carbon materials with controlled structure and properties, as well as in-depth investigation of their functionality in catalytic and electrocatalytic processes.

A significant contribution is the justification of synergistic effects between different metallic, oxide, and carbon phases (Fe–Ce, Ni–Fe–Ce, Au–Fe–Ce, Fe–Cr, ferrite and perovskite systems), and the influence of doping and supports on reaction mechanisms. It has been shown that control over active

phase dispersion, defect structure, and textural characteristics enables targeted control of catalytic behavior in reactions of key importance for energy and environmental applications – methanol decomposition, selective and total oxidation of organic compounds, NO reduction, WGSR, and electrochemical oxygen evolution.

The contributions in Group G are distinguished by clear applied and interdisciplinary orientation, including the development of highly efficient catalysts with improved selectivity and stability, the use of biomass and industrial waste precursors, and the targeted modification of magnetic, optical, and electrochemical properties. This complements and extends the habilitation work, demonstrating continuity and scientific growth.

Evaluation of compliance with national and institutional requirements

The analysis of the quantitative performance of Assoc. Prof. Nikolay Velinov in relation to the minimum national requirements for the academic position of "*Professor"*, as well as the recommended requirements of the Institute of Catalysis – BAS, shows that the candidate meets and exceeds all of them.

Critical remarks and recommendations

I have no critical remarks or recommendations for the candidate.

Conclusion

I have known Assoc. Prof. Nikolay Velinov personally and have excellent impressions of his professional and personal qualities. He is a well-established specialist capable of solving current problems in the field of materials science, synthesis of nanosized and multifunctional composite materials based on transition metal oxides, and Mössbauer spectroscopy. His research is of a high scientific level, and he demonstrates competence both in experimental design and in the interpretation of results.

His scientific contributions are indisputable and fully correspond to the thematic scope of the announced competition. In terms of both volume and quality, his scientometric indicators meet and exceed the recommended requirements for the academic position of "*Professor"* under the national legislation and the regulations of the Institute of Catalysis – BAS.

Based on the submitted materials and my personal assessment, I confidently and with great pleasure recommend to the esteemed Scientific Jury and the Scientific Council of the Institute of Catalysis – BAS that **Assoc. Prof. Nikolay Ivanov Velinov be awarded the academic position of "PROFESSOR"** in the scientific specialty "Solid State Chemistry" for the needs of the Laboratory "Design and Characterization of Catalytic Materials" within the thematic area "Synthesis and Structure of Catalysts and Sorbents".

Date: 30 January 2026 **Member of the Scientific Jury:** ……

/Assoc. Prof. Y. Karakirova, PhD/