OPINION

by Prof. Dr. Diana Todorova Rabadjieva, Institute of General and Inorganic Chemistry, BAS, member of the scientific jury, appointed by order No. RD-09-92/09.12.2025 of the Director of the Institute of Catalysis, BAS, based on a decision of the Scientific Council of the Institute of Catalysis, BAS, protocol No. 11 of 19.11.2025.

Subject: competition for the academic position of "professor" at the Institute of Catalysis, Bulgarian Academy of Sciences, in the professional field 4.2. Chemical Sciences, scientific specialty "Solid State Chemistry", for the needs of the laboratory "Design and Characterization of Catalytic Materials" in the thematic field "Synthesis and Structure of Catalysts and Sorbents", announced in the State Gazette No. 82 of 07.10.2025.

Candidates: Assoc. Prof. Dr. Nikolay Ivanov Velinov (IC-BAS) - sole candidate

Description of the submitted documents and materials

Assoc. Prof. Dr. Nikolay Velinov has submitted the required set of documents, in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB) and the Regulations on the Terms and Procedure for Acquiring Scientific Degrees and for Holding Academic Positions (RTPASDHAP) at the Institute of Catalysis - BAS. The materials have been submitted correctly, accompanied by the necessary evidence.

The total number of scientific publications of Assoc. Prof. Velinov, which are referenced in the scientific database Scopus, is 61. He participates in the current competition with 27 publications all of them indexed in Scopus database. Nine of them are included in Group "B - Habilitation work". Two of them are in category Q1, two - Q2, three - Q3 and two - Q4, with which the candidate scores 159 credits, exceeding the required minimum of 100 credits. The remaining 18 publications are outside the habilitation thesis and are included in group "Г". Seven of them are in category Q1, three - Q2, three - Q3 and five - Q4, with which 340 credits are collected out of the required 220. Dr. Velinov is the first or second author in all publications included in group "B" and in three of the publications from group "G". A list of 539 citations from 2014 (after habilitation for "associate professor", starting from 1.02.2014) to the present is presented, which scores 1078 credits out of the required 120. In my opinion, citation 51 is an auto-citation, but I attribute this to an error that has no impact on the fact that the number of citations exceeds almost 9 times the required minimum. Under the "E" indicator group, Assoc. Prof. Velinov presents evidence of participation in 17 national and 4 international projects and leadership of 2 national projects. Together with the credits awarded for the attracted funds from the projects led by the candidate, 350 credits are collected with a minimum of 150. The evidentiary material is tables extracted from the system for reporting scientific activity at the Bulgarian Academy of Sciences - Sonix. Considering that the data in the system is checked by the scientific secretaries of the institutes, the scientific secretary of the direction at the Bulgarian Academy of Sciences and the chief scientific secretary of the Bulgarian Academy of Sciences, I accept the evidence, although it would be more correct to present copies of the relevant project documents.

General characteristics of scientific and research activities

The main scientific interests of Assoc. Prof. Velinov are related to the synthesis, structural characterization and study of the catalytic properties of ferrite materials. These materials are of significant scientific and applied interest due to their potential as effective heterogeneous catalysts for environmentally significant processes related to hydrogen production, alcohol transformation and oxidation of harmful organic compounds, etc.

The publications from the "Habilitation work" are aimed at the synthesis, structural characterization and study of the catalytic properties of ferrites with a spinel-type structure of the type $Cu_{1-x}M_xFe_2O_4$, where M = Co, Zn, Mn and Ni, x = 0.2, 0.4, 0.5, 0.6, 0.8. The main emphasis in the research is the use of the Mössbauer spectroscopy method to establish the cation distribution in tetrahedral and octahedral positions in the spinel structure and its influence on the physicochemical and catalytic properties of the materials.

The conditions for two methods for the synthesis of ferrite spinels - mechanochemical (treatment duration) and sol-gel self-ignition (pH, fuel/metal ion ratio and heat treatment temperature) were optimized, which allow control over the microstructure, crystallite size, degree of inversion and oxidation state of metal cations.

Materials from ferrite compounds deposited on activated carbons from agricultural waste have been developed, in which a significant influence of the substrate on the phase composition and catalytic behavior has been established. In addition, a new type of Cu–Ni–Fe mixed oxide-nitride materials with catalytic and photocatalytic activity have been synthesized.

The catalytic properties of the synthesized ferrites and ferrite systems have been studied in reactions such as methanol decomposition, carbon monoxide conversion with water vapor, and oxidation of volatile organic compounds. It has been established that mixed ferrites exhibit higher activity and selectivity compared to individual ferrites, and optimal cation ratios have been determined, ensuring maximum catalytic efficiency. It has been shown that catalytic activity is determined to a greater extent by the structure and microstructure of the material than by the presence of noble metals.

Phase transformations of ferrites in a reaction medium have been proven, leading to the formation of specific active phases (magnetites, carbides, alloys, nitrides).

The obtained results contribute to the clarification of the composition–structure–property relationships and create a scientific basis for the targeted design of effective and stable ferrite catalysts.

Publications from group “Г” reflect research on a wider range of compounds, including mesoporous binary and Au- and Ni-modified Fe–Ce and Fe–Hf–Ti oxide systems, additional studies on ferrite and hexaferrite materials, composite catalysts supported on activated carbons and carbon foams obtained from waste biomass. It is shown that the synthesis method and doping determine the phase composition, microstructure and catalytic properties. A mechanism for the formation of Fe–Ce oxide systems is proposed, describing the transition from isolated Fe^{3+} ions in a CeO_2 matrix to aggregated hematite-like phases at increased iron content. It is proven that the texture and porosity of the carbon matrix are key to the dispersion and catalytic behavior of the

deposited oxide and ferrite phases. Effective systems for photocatalytic water purification and methanol decomposition have been developed.

The research also includes the development of iron-containing materials with non-fundamental but socially significant applications, such as the use of fayalite slag from the copper mining industry as a geopolymer precursor, as well as the synthesis of rare-earth-doped hematite nanostructures with tunable magnetic and optical properties.

I have no questions or comments. My recommendation is that Assoc. Prof. Velinov should try to include the training of PhD students in his future activities, since his scientific authority and many years of research experience create excellent prerequisites for this.

Conclusion

The scientific production and activity of Assoc. Prof. Dr. Nikolay Velinov exceed the national minimum requirements for holding the academic position of "professor". His research appears to be both for the fundamental understanding of iron-containing materials and for the development of sustainable catalytic systems with practical application. Assoc. Prof. Velinov has a clearly defined topic that is actual and perspective. In addition, the successful management of projects at the Bulgarian National Science Found proves that he can lead a team of researchers. **Based on all that has been said above, I give your positive assessment of the overall scientific and research activity of Assoc. Prof. Dr. N. Velinov and I strongly recommend him to the Scientific Jury to be elected to hold the academic position of "professor" in Professional Field 4.2 Chemical Sciences**.

06.02.2026

Sofia /Prof. Dr. D. Rabadjieva/