OPINION

by prof. Yuri Kalvachev, Institute of Catalysis, Bulgarian Academy of Sciences

on the materials presented for participation in the competition, published in „*State Gazette*", issue 82/07.10.2025 for occupying the academic position "Professor" in professional field 4.2 "Chemical Sciences", scientific research specialty "Solid State Chemistry" for the needs of Institute of Catalysis, Laboratory "Design and Characterization of Catalytic Materials" in the thematic area "Surface Analysis"

Candidate: **Associate Professor Dr. Hristo Gospodinov Kolev**

The only candidate in the competition is Assoc. Prof. Dr Hristo Gospodinov, who works in Institute of Catalysis, Bulgarian academy of sciences.

Hristo Kolev graduated from the Dobri Chintulov High School of Natural Sciences and Mathematics, Sliven, Bulgaria in 1993, and from the Faculty of Physics, Sofia University in 1998, specialty Engineering Physics. He defended his dissertation for the scientific and educational degree of "Doctor of Philosophy" in 2009 at the University of Münster, Germany. In 2004, he started working as a physicist at the Institute of Catalysis - Bulgarian Academy of Sciences. In 2014, he was appointed as an associate professor at the same institute. He was a 6-month scholarship holder as a senior investigator at the Faculty of Mining, Ecology, Process Control and Geotechnology at the Technical University of Košice, Slovakia, under the research program "Application of X-ray Photoelectron Spectroscopy (XPS) for a Better Understanding of Surface Properties".

The scientific research of Assoc. Prof. Dr. Hristo Kolev is in the field of application of X-ray photoelectron spectroscopy (XPS) as a method for analyzing the surface chemistry, valence states, defect structure and electronic properties of materials with various applications, but mainly in three areas: (i) materials for energy storage and conversion, (ii) nanomaterials for medical applications, and (iii) luminescent oxide- and MOF-based systems, as the main goal of the research is to establish the relationships "structure - defects - properties - function" and to reveal the mechanisms determining the performance of materials in real applications.

The candidate Hristo Kolev appears in the competition, presenting a large number of scientific publications in total, 61 of which are in journals with an impact factor. It is impressive that 22 of the journals are Q1 (first quartile, according to the categorization of WoS and Scopus) and

21 are Q2 (second quartile), i.e. the articles are published in the most renowned international journals in the respective field - Catalysis Today; Applied Catalysis B: Environmental and Energy; Nanomaterials; Chemical Engineering Journal, etc. These works have found a wide response in the scientific literature - they have 1040 citations in the Web of Science and Scopus databases. The Hirsch index (h-index) of Assoc. Prof. Hristo Kolev, checked in the Scopus scientific information database without self-citations, is 19, which indicates high quality of the works and relevance of the tasks being solved. The presented research is original and corresponds to the topic of the announced competition.

The materials for the competition provided to me for review are not well structured and contain many typos. This does not diminish the candidate's contributions to obtaining the academic position for which he is applying.

The contributions of the candidate can be summarized as follows:

First of all, I would point out the methodological contributions: Application of X-ray photoelectron spectroscopy for the analysis of valence states, oxygen defects and surface chemistry in modern functional materials, including MOF-frameworks, high-entropy oxides, nanomagnetites and rare-earth oxides.

The materials that have been studied can be divided into three areas of application:

• Energy materials: The role of oxygen defects, redox states and cationic substituents on the ion-electron transport and stability of high-entropy oxides and lithiated oxyhalides has been determined, leading to optimized charge/discharge mechanisms in Li-ion systems.

• Medicine: Structural-redox mechanisms that govern the magnetic anisotropy, relaxivity and hyperthermal efficiency of nanoparticles have been revealed; Highly sensitive electrochemical biosensors have been developed by controlling surface defects and coordination states.

• Luminescent materials: Relationships between the valence states of rare earth elements, charge-transfer transitions, and emission properties have been established, determining the behavior of MOF-based films, oxide phosphors, and optical coatings.

The candidate Hristo Kolev meets the requirements for occupying the academic position “professor” at Institute of Catalysis – Bulgarian academy of sciences, referred to in Article 29, Paragraph 1, Items 3,4 and 5 of the Law on the Development of the Academic Staff in the Republic of Bulgaria and in the Regulations for its implementation

All other requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria have also been met - a recognized educational and scientific degree of "doctor of philosophy" and an awarded academic position of "associate professor". The diplomas have

been presented, as well as a certificate of internship in the specialty, which shows that he held the academic position of "associate professor" for a longer period than required. A careful review of the materials provided to me for review gives me reason to claim that there is no evidence of plagiarism in the candidate's scientific works and that he meets the condition specified in Art. 29, para. 1, item 6 of the Law on the Development of the Academic Staff in the Republic of Bulgaria. An additional basis for this claim is the publication of the works in reputable journals that monitor for the presence of plagiarism.

The habilitation thesis of Assoc. Prof. Kolev was prepared at a high scientific level and is on the topic "Electron spectroscopy and chemical analysis of catalytic systems based on nanosized metal oxides". The work is based on 10 articles, all published in journals from the first quartile Q1. The contribution of these works is in clarifying the surface and redox characteristics of nanosized metal oxides and their relationship with catalytic activity in various oxidation-reduction processes. These contributions trace the relationship of surface processes and their influence on catalytic activity and open the door to the preparation of active catalytic systems.

Assoc. Prof. Dr. Hristo Kolev meets and exceeds the requirements of Art. 29, para 1 of the Law on the Development of the Academic Staff in the Republic of Bulgaria. Based on the above, I strongly propose to the esteemed members of the scientific jury and the members of the Scientific Council of the Institute of Catalysis - Bulgarian Academy of Sciences to award Assoc. Prof. Dr. Hristo Gospodinov Kolev the academic position of “professor” in professional field 4.2. Chemical Sciences, scientific specialty "Solid State Chemistry".

January 26th, 2026

Sofia Prof. Yuri Kalvachev