

## STATEMENT

on the competition procedure for occupation of the academic position "Associate Professor" in the professional field 4.2 Chemical Sciences (Chemistry of Solid State) published in the State gazette No. 46/ 26.05. 2023

Member of the scientific jury: Prof. DSc Nikolay Nedyalkov Nedyalkov, Institute of electronics, Bulgarian Academy of Sciences

The only candidate for the competition is Dr. Alexander Svetoslavov Tsanev, assistant professor in the "Electron Spectroscopy of Solid Surfaces" laboratory at the Institute of General and Inorganic Chemistry (IGIC), BAS. He obtained master's degree in "Inorganic and Analytical Chemistry" at the Faculty of Chemistry of Sofia University "St. Kliment Ohridski" in 2001. In 2017, he received the educational and scientific degree "Doctor" in the specialty "Chemistry of the Solid State", at IGIC, BAS. Since 2004, he has been working in the "Electron Spectroscopy of Solid Surfaces" laboratory at IGIC, successively holding the positions of chemist and assistant professor. He has been on the latter since 2019. The main direction of his professional activity is the application of X-ray photoelectron spectroscopy (XPS) in the field of describing the mechanisms of formation of various materials in processes such as electrochemical corrosion, catalysis, photocatalysis, electrocatalysis and chemical synthesis and analysis of their main characteristics.

The submitted documents for the competition and their content provide an opportunity for a clear assessment and analysis of Dr. Tsanev's scientific and scientific-applied activities. 21 scientific publications are submitted for participation in the competition, one of which is a book chapter. Of these, 12 were published in journals with an impact factor. The main part of the presented publications are after acquiring the scientific and educational degree "doctor", which is a clear indication of active work at the current stage of his career. For participation in the competition, 38 citations of works in which he is a co-author were submitted. Dr. Tsanev has participated or is participating in 7 projects under national and bilateral (EBR) programs as a team member. Hirsch index according to SCOPUS is 5. Information on participation in 8 conferences is also presented. With his scientometric data, the candidate exceeds the minimum requirements set by ADASRB and the criteria accepted by the Scientific Council of IGIC. Scientific publications are presented in journals that are referenced and indexed in world-renowned databases of scientific information, which are equivalent to habilitation work (indicator C). The total number of points according to this indicator is 129, with a minimum of 100. According to indicator D, publications are presented that are equivalent to 230 points out of the required 220. According to indicator E, related to citations of works in which Dr. Tsanev is a co-author, also the indicated points exceed the required (76 out of 60). For indicator G, the equivalent points of 80 also exceed the required 70.

The scientific activity of Dr. Alexander Tsanev is directed to the field of preparation, characterization and design of coatings to increase the corrosion resistance of low-doped aluminum alloys. The main approach is to apply cerium coatings by immersion in a solution of cerium salts. The role of different types of pretreatment of the Al 1050 aluminum alloy, as well as the subsequent treatment of the formed coating on the morphology, structure, composition and corrosion properties of the surfaces at the different stages, was investigated. A group of

works also describes research related to the role of silver ions embedded in the oxide layer on the surface of an aluminum alloy on the composition and corrosion properties of an anodized aluminum alloy. The topics developed by Dr. Tsanev are current and cause interest from the point of view of practical applications in the field of increasing the corrosion resistance of aluminum alloys used as food and beverage packaging containers. They are the next step, increasing this parameter after the established method of anodization. The research also affects a number of fundamental questions, such as the mechanisms of electrochemical deposition, the influence of the experimental parameters on the work processes, the relationship between the composition of the material and its corrosion properties. The chosen methods for obtaining the coatings and pre- and post-treatments are “classical”, making them easy and cheap to apply, have potential for transfer to industry and are the subject of research interest.

The main scientific contributions of Dr. Tsanev's activity can be attributed to obtaining new knowledge and enriching existing knowledge in the field of obtaining coatings on the surface of aluminum alloys in order to increase their corrosion resistance. The results of the detailed investigations of the surface properties of aluminum alloys and cerium coatings in the various stages of processing can be indicated here. It was established that, the preliminary alkaline activation and acid de-oxidation lead to the formation of surface oxide layers and hydroxyl groups, with different parameters, depending on the experimental conditions. They, in turn, have a different influence on the corrosion properties of the coatings. Data on the mechanisms and effect of inclusion of silver ions in the surface layer of aluminum alloys are also presented. Within the framework of these studies, conditions have been defined for an effective increase in the corrosion resistance of the studied materials.

The candidate's personal contribution is related to obtaining and interpreting the main results of the XPS-based analyzes of the studied surfaces. Since these analyzes are fundamental in describing the processes and in understanding the mechanisms at the various stages of processing, Dr. Tsanev's contribution to the conducted research and reflected in the relevant publications can be defined as essential.

I have no significant critical comments on the content, as well as on the technical presentation of the documents. I would recommend that the candidate, after successfully completing the competition and taking the position of "associate professor", use the self-confidence and confidence it gives and develop several new topics and actively lead research projects.

Conclusion:

My familiarization with the results of the research activity of Assistant professor Alexander Tsanev gives me reason to believe that he is a scientist with a significant contribution in the field of analysis of surfaces obtained by chemical methods for modifying various materials and the design of applications in the field of developing materials with increased corrosion resistance . I believe he has acquired the skills and ability to define and direct research at a high level. Quantitative indicators of his scientific activity correspond to the criteria set by the ADASRB and the Regulations for the terms and conditions for acquiring scientific degrees and for holding academic positions at the IGIC - BAS, necessary for holding the academic position of "Associate Professor". Based on the above, I express my convinced support for his candidacy and recommend the Scientific Jury to support and propose to the Scientific Council of the Institute of General and Inorganic Chemistry, Assistant professor Dr. Alexander Tsanev, to be

elected to the academic position of "associate professor" in professional field 4.2. Chemical Sciences.

12.09.2023

Prof. N. Nedyalkov