БЪЛГАРСКА АКАДЕМИЯ НА НАУКИТЕ
ИНСТИТУТ ПО
МИНЕРАЛОГИЯ И КРИСТАЛОГРАФИЯ
№ 639 НЛ-05-05/03.09.25
СОФИЯ

OPINION

on a competition for the academic position of "Associate Professor" in 4.1. "Physical Sciences" (Electronic Properties of Nanoscale Thin-Film Systems) at the Institute of Mineralogy and Crystallography-BAS, Department of "Structural Crystallography and Materials Science", announced in the State Gazette No. 36/29.04.2025.

Candidate: Assistant Professor, Dr. Petar Yordanov (IMC-BAS)

Member of the scientific jury: Prof. Dr. Rositsa Hristova Titorenkova (IMC-BAS)

1. General characteristics of the submitted materials

Dr. Petar Yordanov participated in the competition for the academic position of "Associate Professor", professional field 4.1. "Physical Sciences" (Electronic Properties of Nanoscale Thin-Film Systems) at IMC-BAS with 14 publications in refereed and indexed journals in Web of Science and Scopus databases, as follows: 11 publications in journals falling in the first quartile Q1, 2 in journals with quartile Q2, and 1 in Q3. The candidate is the first author of five of the publications and is a leading researcher in two international patents. The total number of publications of Dr. P. Yordanov is 17, and the Hirsch index (h-index) of the candidate in Scopus is 12. The points, according to the national minimum criteria and additional requirements in the Bulgarian Academy of Sciences for the academic position "Associate Professor" under 4.1. "Physical Sciences" are as follows: for indicator A - 100 points (80 points required); for indicator B4 - 100 points (100 points required); for indicator Г- 230 points (7 publications in Q1; 2 publications in Q2; 1 publication in Q3) (220 points required); for indicator Д - 100 points (60 points required). The science metric indicators cover and in some cases exceed the minimum quantitative requirements for occupying the academic position "Associate Professor" at the Institute of Mineralogy and Crystallography-BAS.

2. Brief educational and professional background of the candidate

Petar Yordanov graduated from Sofia University "St. Kliment Ohridski" with a Master`s degree in "Chemistry and Physics" from the Faculty of Chemistry in 2000 and a second master's degree in "Integrated and discrete optoelectronics in the optical communications" from the Faculty of Physics in 2003. During the period 2000-2004, he worked as a physicist in the Department of Semiconductors of the Faculty of Physics of Sofia University "St. Kliment Ohridski", where he worked on spectroscopic studies of thin films of β-$FeSi_2$ и Mg_2Si obtained by the ion implantation method. From 2004 to the end of 2009, he worked on a dissertation "Spectroscopic study of $CaMnO_3/CaRuO_3$ superlattices and $YTiO_3$ single crystals", at the Max Planck Institute for Solid State Physics - Stuttgart. Articles No. 3 and 8 of the candidate's list of publications are results of his doctoral dissertation and do not participate in the competition for an academic position. From 2011 to 2023, Dr. Petar Yordanov continues his scientific career at the Max Planck Institute - Stuttgart as a postdoctoral fellow. Since November 2024, he has been part of the Structural Crystallography and Materials Science section at the Institute of Mineralogy and crystallography-BAS. He is currently working on the project: "Synthesis and study of thin films of highly anisotropic compounds for the realization of an ultrafast transverse thermoelectric effect."

3. Main scientific contributions of the candidate

The research activities and interests of Dr. Petar Yordanov are focused in the areas of synthesis of polycrystalline materials, epitaxial growth of nanoscale thin-layer systems (films and heterostructures) on single-crystal substrates, X-ray structural and spectroscopic studies (X-ray, UV-Vis and IR), study of electrical conductivity (specific electrical resistance), the Seebeck coefficient (thermoelectric properties), measurement of time characteristics in the ultrafast transverse thermoelectric effect, generation of electromagnetic radiation in the terahertz range, model analysis, etc.

The publications submitted for the indicator B. 4 with numbers 10, 13, 15 and 17 from the list of publications were published in journals in the first quartile (Q1). In these publications, Dr. Petar Yordanov has a leading role, with the main contribution being in: i) the synthesis and growth of thin films of $Ca_3Co_4O_9$ (10), $PdCoO_2$ (13), $PdCoO_2$ (17; 15) on various single-crystal substrates: $LaAlO_3$ and $SrTiO_3$ (10), Al_2O_3 (13; 17); ii) the detailed measurement of the Seebeck coefficient (S) and the specific electrical resistance (ρ) of the thin films and their dependence on the thickness of the thin films, on the type of crystal substrate, on the oxygen pressure in the measuring chamber, etc.; iii) growth of nanoscale thin films on substrates with different c-axis inclination angles, measurements with a nanosecond laser and determination of the amplitude and time characteristics of the generated voltage as a result of the transverse thermoelectric effect, ideas for a mechanism for generating terahertz electromagnetic radiation based on the ultrafast transverse thermoelectric effect in thin films, model analysis of the generated terahertz radiation, development and implementation of a model of non-equilibrium thermal diffusion, evaluation of the parameters affecting the strength and spectra of the generated radiation. Dr. Petar Yordanov has a leading role and a major contribution to the concepts, obtaining and processing of the results, description of the model, conclusions regarding the generation of terahertz radiation in the transverse thermoelectric effect. The results, moreover, have been patented as a European and world patent, in which Dr. P. Yordanov is the main inventor.

For indicator Γ7 of the minimum national requirements, publications in journals in the first quartile Q1 No. 4,5,6,7,9,11 and 12; Q2 – publications No. 2 and 14; Q3 – publication No. 1 are presented. In these articles, the contribution of Dr. Petar Yordanov consists in the experimental work, characterization of the studied systems – mainly thin films on single-crystal substrates or single-crystal samples, as well as in the data processing, discussions and conclusions. Various optical methods were used, such as measurements in the reflection mode with an applied external magnetic field, spectroscopic ellipsometry, including with a synchrotron radiation source. The candidate has experience in X-ray structural methods for characterization of samples, in measurements of magnetization and conductivity in large temperature ranges.

4. Critical remarks – I have no critical comments.

5. Conclusion

Based on the submitted materials, the scientific publications, and academic contributions of Dr. Petar Yordanov, I find that the candidate fully meets the legal and institutional requirements for the academic position of Associate Professor.

Therefore, I recommend the appointment of Dr. Yordanov to the academic position "Associate Professor" in Physics (4.1. Physical Sciences) at the Institute of mineralogy and crystallography – Bulgarian Academy of Sciences.

18.08.2025

Member of the jury: Заличено съгласно чл. 2 от ЗЗЛД

Prof. Dr. Rositsa Titorenkova