

Regarding the competition for the academic position of "Associate Professor"
in the professional field 4.1. Physical Sciences (Electronic Properties of Nanoscale Thin-Film Systems),
for the needs of the Institute of Mineralogy and Crystallography "Acad. Ivan Kostov", Bulgarian Academy of Sciences (BAS), announced in State Gazette No. 36 of April 29, 2025.

This opinion was prepared by: Assoc. Prof. Todor Stefanov Petrov, PhD, Faculty of Applied Mathematics and Informatics, Technical University – Sofia, professional field 4.1. Physical Sciences / Electronic Properties of Nanoscale Thin-Film Systems, in his capacity as a member of the scientific jury for the competition, according to Order No. 380 RD-09/01.07.2025 of the Director of IMC-BAS.

Only one candidate has submitted documents for the announced competition: Assistant Professor Petar Yordanov Yordanov, PhD, Institute of Mineralogy and Crystallography "Acad. Ivan Kostov", BAS.

The candidate prepared the Master's degree (qualification-educational degree) between 2000 and 2003 with a thesis on "Integral and Discrete Optoelectronics in Optical Communications" at the Department of Semiconductors, Faculty of Physics, Sofia University "St. Kliment Ohridski". The candidate obtained the Doctor of Sciences degree ("Physical Sciences") at the Max Planck Institute of Solid State Physics – Stuttgart and the University of Stuttgart, Germany, in December 2009, with a thesis on "Spectroscopic Study of $\text{CaMnO}_3/\text{CaRuO}_3$ Superlattices and YTiO_3 Single Crystals". Since November 2024 to the present, he has held the academic position of "Assistant Professor" at the Institute of Mineralogy and Crystallography "Academician Ivan Kostov" of the Bulgarian Academy of Sciences.

1. Compliance of the candidate with the conditions for holding the academic position of "Associate Professor"

The research activity and interests of Dr. Petar Yordanov are focused in the fields of synthesis of polycrystalline samples, epitaxial growth of nanoscale thin-film systems - films and heterostructures on single-crystal substrates, performing structural characterization by X-ray diffraction, spectroscopic studies, investigation of transport properties - electrical conductivity (respectively electrical resistivity), Seebeck coefficient (thermoelectric properties), measurement of temporal characteristics in the ultrafast transverse thermoelectric effect, generation of electromagnetic radiation in the terahertz range, model analysis, etc.

The total number of publications with which the candidate is participating in the competition for Associate Professor is 14. The distribution of articles by quartiles is as follows: Q1 – 11, Q2 – 2, and Q3 – 1. The scientific works reflect the candidate's work related to the creation, investigation, and characterization of structures with thicknesses of several tens of nanometers using different growth approaches. The thus formed samples have various applications depending on their

characteristics and the conditions under which they are studied. It should be emphasized that Dr. Yordanov is the first author for 30% of the publications. The candidate's independent citations, according to the Scopus scientific database, are about 400, and his Hirsch h-index is 12 (excluding self-citations). The publications submitted for the Associate Professor competition are not the same as those used to obtain the educational and scientific degree of "Doctor" and to hold the academic position of Assistant Professor.

In his work, the Candidate demonstrates exceptional diversity and depth of experimental techniques, including:

- Various types of spectroscopy (IR, UV-VIS, ellipsometry).
- Material synthesis (pulsed laser deposition of thin films).
- Measurement of thermoelectric and transport properties (Seebeck coefficient, conductivity) under extreme conditions (high temperatures, magnetic field).
- X-ray structural analysis and material characterization.

It is necessary to emphasize that Dr. Yordanov:

- In paper [No. 10], he led the work on the discovery of an **anomalous increase in the Seebeck** coefficient in thin films at high temperatures and developed a model to explain it. This is a typical example of an original scientific contribution.
- In paper [No. 13], he provided **for the first time experimental confirmation** of theoretical predictions of strong anisotropy in delafossite PdCoO₂, also creating a new experimental protocol for its measurement.
- **He made a breakthrough in the field of terahertz technology:** His most significant contribution is in paper [No. 17], where he led the development of a new method for generating terahertz radiation via the ultrafast transverse thermoelectric effect. This discovery is protected by patents and has clear potential for practical application in electronics and communications.

From the above, the interdisciplinary approach and depth of Dr. Yordanov's research is evident. His work covers both fundamental research on electronic correlations in complex oxides and applied research with a clear aim of developing new functionalities and devices. He successfully combines knowledge from solid-state physics, materials science, solid-state chemistry, and electronics.

Dr. Yordanov is a member of the research teams of two international projects. His participation in a collaborative project with an industrial partner, which concluded with a real market product, as well as the Patents (one world and one European, where he is the "main inventor") for a terahertz radiation generator are direct evidence of the innovativeness and commercial potential of his work.

2. Comparison between the candidate's scientometric indicators and the minimum requirements for holding the academic position of "Associate Professor"

Assistant Professor Petar Yordanov, PhD, meets the minimum national requirements (in points) for holding the academic position of "Associate Professor", adopted by the "Regulations for

the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria".

According to the information provided in Document 17 (Minimal Requirements_Associate Professor_Field 4-1 Physical Sciences.docx) from the required set for applying for the academic degree of Associate Professor, the number of points is:

Group of Indicators	Content	Assoc. Prof. Requirement	Candidate's Points
A	Indicator 1	50	50
B	Indicator 3 or 4	100	100
C	Sum of indicators 5 to 10	200	200
D	Sum of points in indicator 11	50	50

Informative table for the criteria

Group of Indicators	Indicator	Points Awarded
A	1. Dissertation for the award of the educational and scientific degree "Doctor"	50
B	4. Habilitation work - scientific publications in editions that are peer-reviewed and indexed in world-renowned scientific databases (Web of Science and Scopus)*	25 for publ. in Q1 20 for publ. in Q2 15 for publ. in Q3 12 for publ. in Q4 10 for publ. in journal with SJR but no IF 6 for other# publ.
C	7. Scientific publication in editions that are peer-reviewed and indexed in world-renowned scientific databases (Web of Science and Scopus), outside the habilitation work*	25 for publ. in Q1 20 for publ. in Q2 15 for publ. in Q3 12 for publ. in Q4 10 for publ. in journal with SJR but no IF 6 for other# publ.
	9. Invention, patent, or utility model for which a protective document has been issued according to the due procedure	25
D	11. Citations in scientific publications, monographs, collective volumes, and patents, referenced and indexed in world-renowned scientific databases (Web of Science and Scopus)*	2 1 in other# publ.

The candidate's scientometric indicators also meet the additional requirements of the Institute of Mineralogy and Crystallography "Academician Ivan Kostov" of the Bulgarian Academy of Sciences.

Additional Requirements (AR):

AR-A1. Publications under indicator A.1 (related to the dissertation) - **30 pts.**

AR-C7. Articles under indicator C.7 (according to BAS requirements) – **20 pts.**

3. Critical remarks and recommendations

I have no critical remarks regarding the candidate's work. The absence of a detailed list of independent citations for each of the articles caused some difficulty. Nevertheless, the number of citations is impressive, far exceeding the requirements. I would recommend that the candidate prepares such a detailed list, which can be easily updated over time.

4. Conclusion

Based on the submitted documents and in accordance with the Law for the Development of the Academic Staff in the Republic of Bulgaria and the Regulations of the Institute, the candidate Assistant Professor Petar Yordanov Yordanov, PhD, fully meets all the minimum, mandatory, and additional requirements for holding the academic position of "Associate Professor" in the professional field 4.1. Physical Sciences (Electronic Properties of Nanoscale Thin-Film Systems).

I express a positive opinion about his election.

Sofia

05.09.2025

Prepared by:

**Заличено съгласно
чл. 2 от ЗЗЛД**

/Assoc. Prof. Todor Petrov, PhD/