

OPINION

on a competition for the academic position of "Associate Professor" at the Central Laboratory of Applied Physics - BAS, Plovdiv in the professional field 4.1. Physical Sciences, scientific specialty "Condensed Matter Physics" according to the announcement in the State Gazette No. 55 of July 8, 2025 with candidate: Ch. Assistant Professor Dr. Hristo Todorov Kisov at the Central Laboratory of Applied Physics - BAS, Plovdiv

The opinion was prepared by: Assoc. Prof. Dr. Malina Mihaylova Milanova at the Central Laboratory of Applied Physics - BAS, Plovdiv.

General characteristics of the submitted materials:

Ch. Assistant Professor Dr. Hristo Kisov is the only candidate in the current competition for the academic position of "associate professor". He graduated as a Master of Engineering from the Faculty of Physics of the Plovdiv University "Paisiy Hilendarski" with a specialization in "Laser Engineering and Technologies". In the period 2009-2013 he was a doctoral student at the Department of Laser Engineering and Electronics, Technical University of Sofia, Plovdiv Branch. In 2013 he defended his doctoral dissertation on the topic; "Development of solid-state quantum generators based on Neodymium-YAG media with uncompetitive simultaneous generation of a pair of lines and frequencies in the range of 1-1.4 microns". He works as a part-time assistant at the Agricultural University, Plovdiv (2012-2013) and at Plovdiv University (2013-2015).

In 2016, he started working as an Assistant Professor at the Institute of Optical Materials and Technologies (IOMT), Acad. Y. Malinovski, Bulgarian Academy of Sciences, Laboratory "Composite and Nanostructured Optical Materials", Sofia, and since 2017, he has held the position of "chief assistant" at the same institute.

In 2021, he started working as a Ch. assistant at the Central Laboratory of Applied Physics (CLAPF) - Bulgarian Academy of Sciences, Plovdiv, where he has been working ever since. In parallel, he continues to work as a chief assistant at the IOMT, Sofia.

The scientific output with which Dr. Hristo Kisov participates in the competition consists of 28 publications (27 of which are in journals with an impact factor or impact rank) and two useful models.

To obtain the academic position of "associate professor", the candidate presents the dissertation work under indicator A. Under indicator group B - habilitation work, presents 9 scientific publications, of which 3 with quartiles Q1, 2 with quartiles Q2, 2 with quartiles Q3 and two publications with impact rank. For the articles under this indicator, he receives 165 out of the required 100 points. Under indicator group D, he presents 2 utility models, 1 patent application and 19 scientific articles, of which 5 of the articles are with quartile Q1, 1 each with quartiles Q2, Q3 and Q4, 10 refereed with impact rank and one in other refereed journals. For this group D, he receives a total of 343 out of the required 220 points according to the law of Bulgarian Academy

of Sciences and the required 200 points according to the Law on Development of Academic Staff in the Republic of Bulgaria. The presented articles have been cited 39 times. A list of 6 participations in international and national conferences is also presented. The candidate has participated in 6 research projects, one of which he was the leader. He has participated in 1 project under the Bulgaria - China 2019 bilateral cooperation program.

Scientific and applied scientific activity. Contributions.

The research activity of Dr. Hristo Kisov is in a current field and the results achieved are of both fundamental and applied science. It is related to the creation of laser systems and the development of laser technologies for the preparation of nanometric layers of biological materials for application in nanophotonics and sensors. In particular, cavity-free lasers based on organic dyes in a solid polymer matrix and in solutions with nanoparticles have been developed and studied. There is no doubt about plagiarism in the presented materials. The main contribution of the author is the creation of an active laser medium, which consists of a solid-state matrix of epoxy resin, in which a pair of organic dyes are incorporated in certain ratios. The resulting medium is self-nanostructured, amorphous and possesses all the properties for obtaining random laser radiation. Radiation with a fluorescence spectral width of over 100 nm was obtained. The threshold energy for laser generation is 1.6 mJ, and the generation efficiency is about 8%.

Generation with continuous tuning in the spectral range 590–610 nm was obtained, using an optical resonator as a tunable element. By optimizing the concentrations of the pair of organic dyes in the solid-state matrix, a four-wave mixing of frequencies in the near-threshold generation was obtained within a single exciting nanosecond pulse. Such a result from a similar material with nanosecond optical excitation was obtained for the first time.

The developed technology for preparing the described laser medium is relatively cheap, simple and safe for health. It is the intellectual property of Hristo Kisov and is protected by a utility model.

The next stage of Hristo Kisov's work in this direction is in an international team and is related to the preparation of a random laser medium with the addition of gold or silver nanoparticles, which serve as additional scattering centers. A reduction in the threshold energy for laser generation and an increase in the intensity of laser radiation were achieved.

The candidate's contributions also include the development and optimization of laser technologies for the deposition of thin nanolayers of biological materials under vacuum. The first vacuum system was created at IOMT-BAS, which works with assisted pulsed laser evaporation of biological substances over diffraction gratings - the so-called MAPLE technology (Matrix-Assisted Pulsed Laser Evaporation). A highly efficient biosensor was prepared using the MAPLE technology, the performance of which was proven by the interaction of hemoglobin Hb with glucose (glycated hemoglobin).

Contributions outside the habilitation work include:

- experimental and theoretical study of the penetration of laser radiation into opaque tissues and determination of the absorbed and scattered part of the energy falling on these tissues (in this case, dental tissues);

- study of the dispersed composition of model emulsions containing biopolymer;

-detection of magnetic field/current by the method of channeled polarimetry and its application for the preparation of precise magnetic field sensors.

Pedagogical activity

Hristo Kisov has been the supervisor of the thesis of 9 successfully defended graduates at the Agricultural University, Plovdiv, the University of Plovdiv, and at the Technical University of Sofia - branch of Plovdiv. He has delivered lectures on "Laser Technology" and "Measurement of Laser Parameters", as well as a number of seminar and laboratory exercises in general physics and optoelectronics.

I have no critical remarks on the submitted materials.

Personal impressions

I have known Hristo Kisov since 2021, since he has been working at the CLAP. His high efficiency and responsibility in his work, in particular in the creation of the Biosensors laboratory at the CLAP, are impressive. In his relations with colleagues, he is responsive and loyal.

Conclusion

My acquaintance with the results of the scientific research activity of Dr. Hristo Kisov gives me reason to believe that he is an accomplished scientist with a significant contribution in the field of creating lasers, laser systems and developing laser technologies for preparing nanolayers for application in nanophotonics and sensorics.

The quantitative indicators of his scientific activity correspond to and exceed the criteria set by the Law on the Development of Academic Staff in the Republic of Bulgaria and the Regulations for its implementation in the Republic of Bulgaria, as well as in the CLAP-BAS, necessary for occupying the academic position of "Associate Professor". I strongly recommend that the Scientific Jury propose to the Scientific Council of the Institute of Electronics that Dr. Hristo Kisov be elected to the academic position of "Associate Professor" in the Professional field 4.1. Physical Sciences, Scientific Specialty "Condensed Matter Physics".

October 16, 2025

Prepared the opinion:

Plovdiv

/ Assoc. Prof. Dr. M. Milanova/