

REPORT

for competition for occupation of the academic position of "Professor" in the professional field 4.1 "Physical Sciences", Scientific specialty "Electrical, magnetic and optical properties of condensed matter", according to the announcement in State Gazette no. 12 of 11/02/2020

Applicant: Dr. GEORGI LALEV DYANKOV, Associated Professor at the Institute of Optical Materials and Technologies "Acad. J. Malinowski" (IOMT)-BAS

Member of Scientific Jury: Dr. Tsvetanka Krumova Babeva, Professor at the Institute of Optical Materials and Technologies "Acad. J. Malinowski" (IOMT)-BAS

The documents under review submitted by the sole candidate in the competition, Assoc. Prof. Dr. Georgi Dyankov, fully comply with the requirements of the Law of the Promotion of Academic Staff in Republic of Bulgaria (ZRASRB), the Regulations for its implementation, the Regulations of BAS and the Regulations on the terms and conditions for acquiring scientific degrees and occupation of academic positions at IOMT-BAS. In the competition the candidate participates with the equivalent of habilitation thesis, consisting of 8 publications, merged thematically and concerning the field of theoretical modeling of plasmonic structures, 14 papers out of the habilitation thesis, 3 utility models and 2 filled patents. All papers are peer-reviewed and published in indexed journals with Impact factor (13 papers) and SJR (9 papers) and divided as follows: 7 in Q1, 4 in Q2, 1 in Q3 and 1 in Q4. A list of 132 citations was presented, and 108 from them were selected for the competition. Dr. Dyankov is a co-author of 7 textbooks in physics and astronomy for 7th, 8th, 9th and 10th grade of the secondary school, as well as of 8 textbooks of tests and exercises in physics and astronomy, all published and used in the school network. Dr. Djankov has disseminated the results of his scientific work through participations, in person or in co-authorship, in 37 scientific forums (25 international and 12 national) and has delivered 5 invited lectures, 3 of which at universities in Taiwan. The presented documents show good project activity - Dr. Dyankov was a project leader of 7 projects, two of them being technological. He has participated in the working teams of 22 projects.

The materials presented in the competition not only cover the minimum national requirements and those of BAS and IOMT, but significantly exceed them:

- group A – 50 points (minimum requirements – 50 points)
- group B – 147 points (minimum requirements – 100 points)
- group Г – 320 points (minimum requirements – 220 points)
- group Д – 216 points (minimum requirements – 120 points)
- group E – 326 points (minimum requirements – 150 points)

A very good impression is made by the additional document submitted to the competition in which Dr. Dyankov very clearly distinguishes thematically the contributions used for the PhD degree, the academic position "Associated Professor" and those in the current competition for professor.

THEORY OF THE CANDIDATE

The scientific activity of the candidate fully corresponds to the competition's topic. The obtained scientific results and contributions are mainly in the field of condensed matter physics and are particularly related to the development of optical bio-sensors in which the registration of the signal is performed by surface plasmon resonance (SPR). Assoc. Prof. Dyankov's research aimed at solving two main problems inherent in sensors - increasing the sensitivity and selectivity of the recognition layer and separating the useful signal from the background. In solving the first problem, experimental approaches were used. Purposely, a methodology for direct immobilization of the recognition medium by physical means was developed using the MAPLE (Matrix Assisted Pulsed Laser Evaporation) method. As the most significant contribution here I will mention the successful immobilization of hemoglobin on a diffraction grating created in an optical fiber and the implementation of the reaction leading to the production of glycated hemoglobin in order to create a biochip for blood sugar detection by saliva analysis. The approaches to solving the second problem are entirely theoretical. The most important for me here are the contributions related to i) the theoretical proof of the possibility of excitation of SPR assisted by chiral nematic and chiral smectic liquid crystals as a buffer layer in the *Kretschmann* configuration and ii) the idea of "colored" plasmon where light in a wide spectral range was used for plasmon excitation. Applied scientific contributions are subject to intellectual property (protected by utility models and patents) and are related to optical sensors for measuring current, blood alcohol, fire sensor and recognition systems. Two of the works were awarded silver (2016) and bronze (2017) medals at the Innovation Exhibition in Taipei, Taiwan.

Regarding the teaching activity of the applicant, Dr. Dyankov was a lecturer at the University of Plovdiv, and at the Technical College of the University of Plovdiv in Smolyan, as well as at Chiao Tung University, Hsinchu, Taiwan. At the beginning of his career he was a part-time teacher of physics at the Sofia High School of Mathematics and the Technical School of Woodworking. Assoc. Prof. Dyankov works very well with students and PhD students. He was the supervisor of 3 PhD students (2 successfully defended their theses in 2016 and 2017; the third is in the defense procedure with expected date of viva in October 2020). He has also supervised 6 master and bachelor students (4 at the University of Plovdiv and 2 at the University of Sofia).

Regarding the personal contribution of the applicant, I have no doubt that it is significant. I have known Dr. Dyankov since 2016, when he has started working in IOMT on a new topic for IOMT, related to the development of biosensors. I have witnessed how with the help of project funding, available equipment, assistance from colleagues and numerous hours per day spent in the laboratory, he managed to build the necessary facilities and devices for deposition and characterization of nanostructured layers of biomolecules. This was an essential prerequisite for development various biosensors, based on a variety of bio recognition materials. At the same time, he was a supervisor of a full-time PhD student, who managed to present her PhD thesis for pre-defense within the 3-year term.

CONCLUSION

The obtained results and contributions are significant and not only fully meet the minimum national requirements, as well as those of BAS and IOMT, but exceed them substantially. Considering the materials presented in the competition and my personal impressions, I can confidently conclude that Assoc. Prof. Dr. Georgi Dyankov is an experienced scientist, trained experimenter and established expert in the field of condensed matter physics with great experience in research and development, teaching, scientific administration and applied science.

Based on all written above, I strongly recommend the respected Scientific Jury to support the application and propose to the Scientific Council of IOMT - BAS, Associated Professor Dr. Georgi Lalev Dyankov to be selected for the academic position "Professor" in the professional field 4.1. Physical sciences.

August 13th 2020

/Prof. Dr. Tsvetanka Babeva/