ATTITUDE

to the competition for the academic position Full Professor in Physical sciences (Electrical, magnetic and optical properties of condensed matter), according to the announcement in State Newspaper № 12 / 11.02.2020 with an applicant Dr. Georgi Lalev Dyankov, Associate Professor at the Institute of Optical Materials and Technologies (IOMT) of the Bulgarian Academy of Sciences (BAS)

prepared by Alexander Alexandrov Dreischuh, Dr.rer.nat.habil., Professor in Sofia University "St. Kliment Ohridski" (SU), Head of the Department of Quantum Electronics

1. The only applicant Assoc. Prof. Georgi Dyankov has submitted all the necessary documents for participation in the competition for the academic position "Full Professor", required under the Regulations for the Conditions and Procedures for Awarding of Scientific Degrees and for Occupation of Academic Positions in BAS and according to the specific requirements of the IOMT- BAS. His overall scientific activity is reflected in 46 articles in peer-reviewed and refereed journals and in 5 full text publications in conference proceedings. In the present competition he is participating with 19 peer-reviewed and refereed papers (all of them after 2004) and with 3 full text publications in conference proceedings (all of them after 2004). All publications are within the scope of the scientific specialty of the competition. For the present competition Dr. Dyankov is presenting also two patent applications and two further patens (more precisely - 1 patent and one useful model). Data for participations in 25 international and in 12 national scientific events, as well as for further 5 invited talks are presented.

2. The candidate in the competition has acquired the scientific and educational degree "PhD" in 1987 from the Institute of General Physics of the Russian Academy of Sciences (Moscow, Russia) and is occupying the academic position "Associate Professor" as follows: from February 1998 to July 2008 – in the Institute of Solid State Physics – BAS, from October 2012 to August 2015 – in the Technical College Smolyan, from July 2011 to December 2015 – in Plovdiv University "P. Hilendarski", and from January 2016 – present – in IOMT-BAS. Dr. Dyankov has been post-doctoral fellow (Nov. 2002-Sept. 2003) in Tshin Hua University (Taiwan) and has occupied the position of lecturer and researcher (Sept. 2003-June 2004) in Chiao Tung University (Taiwan) and a research position in the Industrial Technology Research Institute (Taiwan; June 2004-March 2009). In his list of scientific publications presented for the competition, the earliest publication included is from 2004. This proves that these publications were not used in prior procedures for obtaining other degrees and titles. They are correctly presented in separate parts of his list of publications. Quantitatively classified, the publications Assoc. Prof. Dyankov is using for participating in the competition are: according to indicator B4 - eight with impact factor (IF) and one with impact rank (SJR); according to indicator Г7 - 6 with IF and 7 with impact rank. The data in the table below prove that the candidate fully satisfies the minimum national requirements and the requirements of the Regulations for the Conditions and Procedures for Awarding of Scientific Degrees and for Occupation of Academic Positions in IOMT-BAS. I would like to emphasize that, in quantitative terms, Assoc. Prof. Dyankov practically satisfies the cumulative requirements for the degree of Doctor of Sciences (Dr.rer.nat.habil.) and for the academic position of Full Professor. Data for 135 independent citations of his papers are presented, from which, for the present competition, he is using 108 citations.

Group of indica-tors	Indicator	According to the Requirements of IOMT		For the applicant in the competition, according to the submitted documents
		Required for „Dr.rer.nat. habil."	Required for „Full Professor"	
А	1	50	50	50
Б	2	100	----	----
В	3 / 4	----	100	147 2 x 25 points (Q1) = 50 points; 3 x 20 points (Q2) = 60 points; 1 x 15 points (Q3) = 15 points; 1 x 12 points (Q4) = 12 points; 1 x 10 points (SJR) = 10 points
Г	5+6+... +10	100	220	**Г7 + Г9 +Г10 = 320 points** **for Г7 – 215 points,** including 5 x 25 points (Q1) = 125 points ; 1 x 20 points (Q2) = 20 points; 7 x 10 points (SJR) = 70 points **for Г9** (patent/useful model) – 3x25 points = **75 points** **for Г10** (application for patent/useful model) – 2x15 points = **30 points**
Д	11	100	120	108 citations x 2 points = **216 points**
Е	12 +... 20	----	150	**315.7 points (not 326 points as stated in Appendix #13 of the applicant's documents), including** 2 successful PhD students – **100 points**; participation in 3 national research projects, 3x10т.= **30points;** project leader of 1 project with the National Science Fund-Bulgaria – **20 points; 14 points** for acquired funding; 7 textbooks for scholars – **100 points**; 8 school aids – **51.7 points**

3. The activities of the applicant Assoc. Prof. Dyankov are both scientific, with a strong accent on practical applications (carried out also abroad, in foreign universities and companies (Friedrich Schiller University Jena (Jena, Germany) and Institute of Nanomaterials and Technologies (Rabat, Marocco)), as well as pedagogical – in the period he was directly involved in the educational process in schools and in state-supported universities and was engaged with writing textbooks for schools and aids for schools in Bulgaria. I would say that the applicant Assoc. Prof. Dyankov has had a varied and dynamic professional career.

4. In the period 2011-2015 the pedagogical activity of Assoc. Prof. Dyankov in Bulgaria is related mainly to the Faculty of Physics of Plovdiv University and with its Technical College (Smolyan). He has been scientific advisor of two PhD students who already defended their theses and is supervising, presently, a third one. He has been scientific advisor of four students from Plovdiv University who successfully defended their diploma theses. I agree with the claim that in the late 80s and in early 90s he was scientific advisor of two other students from the Faculty of Physics, Sofia University, because I personally know one of them – Dr. Ventzislav Stoev, who is presently with the company Spectra

Physics (USA) holding a key research position. He has been a tutor of students within the project "Student internships" of the Ministry of Education and Science (Bulgaria).

5. Main contributions.

In the self-assessment of his scientific contributions, Assoc. Prof. Georgi Dyankov has clearly identified the main thematic area of the publications he is using for this competition – study of biosensors, based on surface plasmon resonance. This subject is different from the subject of his studies, for which the PhD degree was awarded to him (development and characterization of polarization-maintaining optical fibers), and from the subject, for which he got the Assoc. Prof. – degree (nonlinear effects in optical fibers – theoretical studies of propagation of solitons; study of fiber-optical sensors for temperature, pressure and magnetic fields). The scientific contributions of Assoc. Prof. Dyankov in the publications he is using in this competition are, according to his formulation, related to solving the problem of the non-specific molecular reactions, which is characteristic of biosensors based on surface plasmon resonance (SPR). The detection based on SPR can result in a non-specific signal, although the molecules of the recognition layer are with 100% specificity, since the plasmon wave is penetrating outside the detection layer. Assoc. Prof. Dyankov is outlining two strategies for solving the problem of the non-specificity – (i) optimization of the recognition layer and (ii) separation the specific from non-specific interactions. Part of his results with the highest number of independent citations is devoted to the second strategy. In [A8] (8 citations) the authors analyze a new structure of a biochip based on SPR including bimetallic layer composed of silver and gold sub-layers. In order to excite two (or more) plasmonic modes with different mode distributions but with equal propagation constants, the different dispersion characteristics of the two metals are used. Equal propagation constants are needed for simultaneous excitation of the two modes at the same angle of the incident polychromatic light. The polychromatic light is exciting the modes at different wavelengths when their constants of propagations are the same. A buffer dielectric layer between the metal layers is critical to maintain the desired mode structure. The developed method has two significant advantages: one of the modes is acting as a signal channel and the other mode – as a reference channel. Both channels are overlapped in space. Hence, the discrimination between the specific and non-specific interaction appears possible within a single spectral measurement. In [A7] (11 citations) the plasmonic structure is optimized with respect of the selectivity of the biochip. The result is that the surface of the biochip mimics the surface of a chessboard. The two types of "fields" differ in the thickness of the gold layer, which changes with 20 nm. One of the types of the "fields" is supporting the signal plasmon, the other type – the reference plasmon. The optimal dimension of each "field" is estimated to be several hundred of microns, which minimizes the diffraction effects. When the exciting beam is illuminating several thousand "fields", the two channels practically coincide in space. In [A6] (3 citations) it is shown that the bimetallic plasmonic structure is supporting the propagation of both short-range (SR) and long-range (LR) plasmonic modes, which can be used for distinguishing between specific and non-specific interactions in a single spectral measurement. It is shown, that a structure simultaneously supporting the LR-mode at a wavelength of 958 nm as well as the SR-mode at a wavelength of 700 nm is feasible.

An interesting result is published in [A1] - direct immobilization of hemoglobin on a long-period diffraction grating created in an optical fiber. The immobilization is performed using the so-called MAPLE method (Matrix-Assisted Pulsed-Laser Evaporation). The key reaction is hemoglobin + glucose = glycated hemoglobin and the glycated hemoglobin is detected. It is shown that this approach

is leading to a well expressed relation between the concentration of glucose and the shift of the transmission spectrum of the incident white light. As a result, low glucose concentrations down to 1 mmol/L are detected. For implementing the MAPLE method (which is new to me) a technological set-up has been developed and the relevant technical parameters are determined which guarantee the immobilization of hemoglobin and myoglobin while preserving their biological activity and with a controllable thickness of the deposited recognition layer [B1,B3,B5,B7].

A biochip based on surface plasmon resonance (SPR) is developed which involves a gold-coated diffraction grating. A detailed study of the deposited biolayers using infrared Fourier-transform (FTIR) spectroscopy and atomic force microscopy (AFM) is conducted. The FTIR-analysis has shown the preservation of the main vibrational transitions. AFM analysis has demonstrated the nanostructured nature and the quality of the layers. Mentioning four substantially different experimental methods in the last paragraphs of this attitude is indicative for the personal abilities of Assoc. Prof. Dyankov as an experimentalist. With this, by no way, I do not underestimate his qualification as a theoretical physicist, which is proven in other publications with his co-authorship. In the context of the present procedure I will take the liberty to provide two brief examples. For me, personally, of a special interest are the analyses of Assoc. Prof. Dyankov based on elements of singular optics (more precisely – on phase and polarization vortices). In [B10], for the first time to the best of my knowledge too, polarimetry based on vortex polarization is proposed. The idea in [B12] how to create a composite nanomaterial by using an ordered structure of nano-rings seems feasible too using an ordered array of bright beams in the focus of a lens, each one – structured to carry an optical vortex and, hence, playing the role of a ring trap for metallic nano-particles.

6. Recognition of the applicant's scientific publications in the literature.

The total number of citations of the publications of the applicant is 135. For the present competition he is using 108 citations, practically all of them – in Scopus and in Web of Science. The total number of his articles with impact factors is 32, the number of these with impact rang – 10. His h-factor is 6 (my own evaluation on the base of the submitted list of citing articles). My overall impression is that the applicant's publications have found worthy recognition and will continue to be adequately reflected in the specialized scientific literature.

7. In my opinion, the candidate's leading contribution to the joint publications is well expressed. From the overall data for 40 peer-reviewed and referenced publications, excluding the first 6 from his PhD study, he is a first author of 20 papers (14 of them he is using for the competition) and last author of 8 papers (5 of them he is using for the competition). I would like to mention that the first 6 publications resulted from his PhD studies and the fact that in these publications he is not a first co-author is probably because of the adopted, at this time, ordering of the author's names in alphabetical order.

8. I have no critical remarks neither regarding the submitted documents, nor regarding the publications presented by the applicant for the competition. Technically, the documents are prepared precisely. At some places the terms (in Bulgarian) "laser ray" and "coefficient of refraction" squeeze through instead of "laser beam" and "refractive index", however this seems to be just a negligible technical inaccuracy.

9. Personal impressions from the applicant. In the late 80s and in early 90s I witnessed that Assoc. Prof. Dyankov served as a scientific advisor of two diploma students from the Faculty of Physics, Sofia University. Thereafter, during the years, I got very positive responses for his work from Prof. Ivan Uzunov and from Prof. Tinko Eftimov – his co-authors in some of his earlier publications. My personal impressions are that he is an ethical and steady colleague and the discussion of a particular problem with him is always a pleasure.

10. Conclusion.

The candidate in this competition Assoc. Prof. Dr. Georgi Dyankov has significant contributions to the scientific specialty of the competition. The bibliographic data of his publications fully satisfy the requirements of the Regulations for the Conditions and Procedures for Awarding of Scientific Degrees and for Occupation of Academic Positions in BAS and the specific requirements of the IOMT- BAS. Quantitatively, Assoc. Prof. Dyankov is satisfying the cummulative requirements for the scientific degree "Doctor of Science" (Dr.rer.nat.habil.) and for the academic position "Full Professor". I have no critical comments regarding the publications and documents submitted by the applicant for the competition. My personal impressions from the applicant dating back to my early career days as an Asst. Prof. are excellent.

In view of everything written above, herewith **I strongly recommend to the honorable Scientific Jury TO RECOMMEND to the Scientific Council of the Institute of Optical Materials and Technologies at the Bulgarian Academy of Sciences TO APPOINT Assoc. Prof. Georgi Lalev Dyankov to the academic position "Professor" in Physical Sciences (Electrical, magnetic and optical properties of condensed matter).**

Sofia, 12.08.2020r.

Attitude prepared by:

/Prof. Alexander Dreischuh/