

REVIEW

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competition for the occupation of the academic position "Professor",
Professional field 4.1. Physical Sciences, Specialty in Condensed Matter Physics
according to an announcement in the State Gazette, issue 61 from 11.02.2020 for the needs of the
"Composite and nanostructured optical materials" at the Department of "Optical Materials", IOMT -BAN.
Applicant: Assoc.Prof. Georgi Lalev Dyankov, PhD

Assoc. Prof. Dr. Georgi Lalev Dyankov is the only candidate in the competition for the academic position of
"Professor", announced in the State Gazette, issue 12 of 11.02.2020 for the needs of the laboratory
"Composite and nanostructured optical materials" at the Department of "Optical Materials", IOMT -BAN.

1. General characteristics of the presented materials.

In the competition for the academic position of "Professor" Assoc. Prof. Dr. Georgi Lalev Dyankov
participated with a total of 22 scientific publications in refereed international journals, including:

- for habilitation work (to indicator B4) he presents 8 publications published in journals with impact factor
and impact rank
- 14 publications (including 13 published in impact factor or SJR journals and one short communication
from the IEEE conference) to indicator D.

Assoc. Prof. Dr. Georgi Lalev Dyankov also participates in the current procedure with 2 patent applications
and 3 protected utility models.

A total of 8 publications are included in the habilitation thesis (indicator B4) with categories: Q1 (2
publications), Q2 (3 publications), Q3 (1 publication), Q4 (1 publication) and 1 in SJR. The publications were
published in the period 2011 – 2020, related to the research in the field of optical sensors and in particular
biosensors operating on the phenomenon of Surface Plasmon Resonance. In 5 of all 8 publications Assoc.
Prof. Dyankov is the first author.

The publications outside the habilitation work are 14 (to indicator D), of which 6 articles are in referenced
international publications (including 5 publications in category Q1, 1 in category Q2) and 7 publications in
journals with SJR. There is also 1 short report in a conference without impact factor or impact rank. All
articles were published in the period 2004 - 2020. In 8 of them Assoc. Prof. Dyankov is the first author.

The citations under the competition procedure are 108.

In the general list of his scientific works Assoc. Prof. Dr. Georgi Dyankov has indicated a total number of
scientific publications - 46; of which 37 published in impact factor or SJR scientific journals. The total
citations are 135. h-index of the candidate is 8.

The dissertation for ONS "Doctor" entitled "Polarization properties of anisotropic single-mode optical fibers" is written and defended on 5 publications with impact factor or impact rank.

Dr. Georgi Dyankov participated in the competition for the academic position of "Associate Professor" with 15 scientific publications (in the period 1984 -1998).

According to the requirements for holding the academic position "Professor", set in the Law for Development of the Academic Staff in the Republic of Bulgaria (RASRB) and the regulations for the conditions and procedure for acquiring scientific degrees and holding academic positions of BAS, candidate Assoc. Prof. Dr. Georgi Djankov presented:

to indicator A - 50 points (from a minimum of 50 points)

to indicator B - 147 points (from a minimum of 100 points)

to group of indicators G - 308 points (from a minimum of 220 points)

G 7. 13 scientific publications in publications referred to in Web of Science and Scopus, outside the habilitation thesis - 203 points

G 9. 3 protected utility models - 75 points

G 10. 2 filled applications for patent - 30 points

to indicator D 11 -216 points (from a minimum of 120)

108 citation in scientific journals, monographs, collective volumes and patents - 216 points

to group of indicators E -326 points (from minimum 150)

E13 Guide of 2 successfully defended doctoral students - 100 points

E14. Participation in a national scientific or educational project -30 points

E16. Management of a national scientific or educational project - 20 points

E18. Raised funds for projects led by the applicant -14 points

E19. Published university textbook or textbook used in the school network - 100 points

E 20. Published university textbook or textbook used in the school network -51.7 point

The materials submitted by the candidate include all required documents related to this competition. The science metric indicators of Assoc. Prof. Dr. Georgi Dyankov fully cover the requirements for holding the academic position of "Associate Professor", set in the Regulations of ZRAS RB, ZRAS-BAS and IOMT-BAS.

2. General characteristics of the scientific, scientific-applied and pedagogical activity of the candidate

Assoc. Prof. Dr. Georgi Dyankov graduated from Sofia University "St. Kliment Ohridski" in 1981, Faculty of Physics, Department "Solid State Physics".

Later in the same year he began as researcher at the ISSP-BAS, and in 1998 he was elected to the academic position of "Associate Professor" with 15 publications (published in the period 1984 -1998). The scientific contributions to the "Associate Professor" procedure are related to theoretical studies of nonlinear effects in solitons and experimental studies of optical fibers related to the development of fiber-optic sensors of

temperature, pressure and magnetic field. A research on the optical characteristics of silenite crystals (№25-40 from the general list of publications) is also included in his scientific contributions.

Followed by long-term specializations in Taiwan (respectively at Tsing Hua University, National Chiao Tung University and Industrial Technology Research Institute (ITRI)) - a total of 7 years, as well as a 2-year specialization at the Institute of Nanomaterials and Technologies, Rabat, Morocco.

From 2011 to 2015 he works at "Paisii Hilendarski" University of Plovdiv, Faculty of Physics, Department of Optics and Atomic Physics as Associate Professor. He serves as a deputy dean in the same University.

Assoc. Prof. Dyankov also worked in the field of biometrics in BIODIT Ltd., Sofia in the period 2017-2018.

Since the beginning of 2016 he become an employee at IOMT-BAS, where he continues and successfully develops his knowledge in the study and applications of bio sensors based on surface plasmon resonance principle- modern topic, requiring theoretical and experimental knowledge in solid state physics, liquid crystals, optics and biophysics. Currently, Assoc. Prof. Dyankov is the leader of a team of full-time doctoral student (in the process of defense), researchers and intern students.

A list of 25 participations in international congresses and conferences and 12 participations in national congresses, conferences and seminars is presented.

The applicant has participated in 22 projects at the NSF and other funding organizations.

He has been a leader of 7 research projects, including an ongoing project with NSF ("Biochip based on new plasmon structures and nano-structured bio-recognizable elements" DFNI D18 / 8).

He is an author and co-author of 7 published textbooks (published by Anubis) and 8 textbooks used in the school network (published in the period 2008-2019).

There are nominations for the best article of the Institute for Nuclear Research, BAS in 1997 and the best article with scientific and applied nature of IOMT-BAS for 2019, as well as a silver award for invention at the International Exhibition of Innovations in Taipei, September 2016 and a bronze award for invention at the same exhibition for innovation prize again in Taipei, September 2017.

Assoc. Prof. Dr. Georgi Dyankov has very rich pedagogical experience in working with students. He was a part-time assistant at the Technical College, Smolyan in the period 2011-2015. He was a lecturer at the Faculty of Physics "Paisii Hilendarski" University of Plovdiv. He teach physics at Sofia Mathematical High School in the period 1999-2002.

He was the supervisor of 2 doctoral students (1 full-time and 1 part-time) at "Paisii Hilendarski" University of Plovdiv (successfully defended in 2016 and 2017), he is currently a supervisor of a full-time doctoral student (in the process of defense), as well as supervised 4 Master students.

Prof. Dr. Georgi Dyankov also has invited lectures at seminars at the University of Taiwan, Sofia University and the Department of Teachers Qualifications.

3. Main scientific and / or scientific-applied contributions with an assessment of the extent to which they are the personal work of the candidate.

The candidate's scientific activity is in the field of development of optical sensors and in particular biosensors, in which the registration of molecular interactions is carried out on the basis of Surface Plasmon Resonance (SPR) principle. The characteristics of the recognition layer are the major factor determining the sensitivity and selectivity of the developed biosensors and exactly on this problem the main research and scientific contributions presented in this procedure are focused.

Major scientific contributions

The main scientific contributions can be summarized in 2 groups (areas) related to the implementation of 2 approaches to solve the problem of non-specific molecular reactions characteristic of SPR biosensors.

- The scientific contributions belonging to the first thematic area are focused on the experimental work, using an approach to optimize the recognition layer
- The scientific contributions belonging to the second thematic area are entirely theoretical and are aimed to recognize/ separate the specific from the non-specific interactions.

To the **scientific contributions from the first thematic area** should be noted the experimentally proven for the first time efficiency of direct immobilization in biosensor (A1 from habilitation work). The immobilization of hemoglobin was performed on a diffraction grating created in an optical fiber.

Also, for the first time (works B1, B3, B5, B7 outside of habilitation work) direct immobilization of metalloproteins was performed and a SPR biochip was proposed by direct immobilization, performed by the matrix-assisted pulsed-laser evaporation (MAPLE) method. A new medium has been developed - a binary mixture of rhodamine 6G and rhodamine B embedded in an epoxy resin matrix, for use in biosensors (B2, B4, B6 outside of habilitation work).

To the **scientific contributions from the second thematic area** should be noted the proposed new structure of the biochip, based on a bimetallic layer composed of silver and gold sublayers (A8 from habilitation work). A new quality of the bimetallic plasmon structure has been established, consisting in maintaining the spread of the so-called long-range (LR) and short-range (SR) plasmon modes (A6 from habilitation work). For the first time, the possibility of SPR excitation was theoretically analyzed using a chiral nematic and a chiral smectic as a buffer layer in the so called "Kretschmann configuration" (A2 from habilitation work).

For the first time, the phenomena of the metal-chiral smectic boundary were theoretically studied, as the liquid crystal (TC) layer is located after the metal layer under the conditions of excitation of SPR (A3, A4, A5 from habilitation work). For the first time, the idea of "colored" plasmon (B8 outside habilitation work) was proposed and theoretically analyzed.

Scientific and applied contributions

In addition to the scientific contributions, the applicant also presents **scientific and applied contributions** through 3 current utility models and 2 applications for patents, covering activities in the period 2015-2018.

Here, should be noted the invention of a device (C3), which realizes non-invasive detection of blood alcohol concentration with simultaneous personal identification, designed to prevent driving after drinking alcohol. Based on this registered intellectual property, a project under H2020 was won.

It should also be noted the developed fire sensor (C1, C2), intended for use in rooms with the highest fire risk and explosive objects, as the optical communication with the sensor is carried out through optical fibers. This intellectual property was awarded with Bronze Medal for Invention at Taipei Innovation Exhibition, 2017.

An optical sensor (C5) for measuring current (magnetic field) in high voltage conditions with reference channels having the same optical path is also proposed. This intellectual property was awarded by Bronze Medal for Invention at Innovation Exhibition in Taipei in 2016.

The candidate also attached a document distinguishing the scientific contributions presented in this procedure from the contributions with which he has already participated in the procedures of acquiring the educational and scientific degree "Doctor" and the academic position "Associate Professor".

Based on the requested materials on the competition and the expert activity of Assoc. Prof. Dyankov, it is obvious that the reported scientific contributions are mainly personal work of the candidate. He is also a leading author in most of his publications.

4. Reflection of the candidate's scientific publications in our and foreign literature:

The cited references of scientific publications (with which the candidate participates in the competition) according to Web of Science and Scopus are 108.

The total number of citations of all scientific publications of the candidate is 135 times, the h - index of the candidate is 8.

5. Critical remarks of the reviewer on the submitted works, including on the literary awareness of the candidate

I have no remarks to the presented publications and materials.

6. Personal impressions of the reviewer about the candidate

I know Assoc. Prof. Dr. Georgi Lalev Dyankov from the time of his work at the ISSP-BAS, as well as from his specializations at NCTU, NTHU and ITRI, Taiwan. I have excellent impressions of his theoretical and experimental knowledge in the field of optics and physics of liquid crystals.

The documents presented in the competition are very well arranged, and the results of the scientific activity are presented with an accurate interpretation.

7. Motivated and clearly formulated conclusion (which candidate meets the requirements of the Regulations of reports of IOMT-BAS for holding the academic position).

The materials and scientific works of Assoc. Prof. Dr. Georgi Lalev Dyankov presented at this competition characterize the candidate as a highly qualified specialist in the field of optics, sensors and more specifically on biosensors working on the principle of Surface Plasmon Resonance. Here I would like to note the active participation of Assoc. Prof. Dr. Georgi Lalev Dyankov in applications of patents and utility models, as well as his authorship of textbooks and teaching aids.

The above data show that the science metric indicators of Assoc. Prof. Dr. Georgi Lalev Dyankov meet and even exceed the requirements for holding the academic position "Professor" set in the Law on the Development of the Academic Staff in the Republic of Bulgaria (RASRB) and the Rules of Procedure for acquiring scientific degrees and holding academic positions at IOMT - BAS.

Based on the above statements I express my full support for the application of Assoc. Prof. Dr. Georgi Lalev Dyankov and I recommend the Scientific Jury to support and propose to the National Assembly of IOMT-BAS, Assoc. Prof. Dr. Georgi Lalev Dyankov to be elected to the academic position "Professor" in the field 4.1. Physical sciences.

14.08.2020 r.

Sofia

Reviewer:

/Vera Marinova, Prof. DSc. /