REVIEW

on the presented materials

for acquisition on the academic position "Professor **" in** Competition for "Professor"

in professional direction 4.1 physical sciences , Physics of atoms and molecules

according to the defense procedure at the Faculty of Physics (FzF)

of Sofia University "St. Kliment Ohridski" (SU)

The review was prepared **by** : **Professor Tsonko Mitev Kolev , Doctor of Chemical Sciences ,** Institute of Molecular Biology **"** Rumen Tsanev " , Bulgarian Academy of Sciences ., in quality to a member of the scientific jury
according to An order RD -38-174 / 20.04.2023. of the Rector of Sofia University.
announced in SG No. 24/17/03/2023, page 58.

Author of the presented materials : Stanislav Balushev, associate professor of the Ministry of Education Balushev

I. General description of the presented materials

Name: Stanislav Balushev Balushev
Date of birth: 04.05.1965, Sofia, Bulgaria.
Languages: Bulgarian (native), German (fluent), English (fluent), Russian (fluent).
Department of Optics and Spectroscopy
Faculty of Physics, SU "St. Kliment Ohridski"
James Boucher Blvd. 5, 1164 Sofia
E- mail : balouche@phys.uni-sofia.bg
http://optics.phys.uni-sofia.bg/en/staff/stanislav/Group.html

1. Data on submitted documents

October, 1998 PhD Dissertation: "Phase modulation of light beams. Dark space solitons ",
Faculty of Physics, SU "St. Kliment Ohridski", Sofia, Bulgaria
June, 2009 ÷ until now (April, 2023) Associate Professor, Department of Optics and Spectroscopy, Faculty of Physics, SU "St. Kliment Ohridski"
1164 Sofia, Bulgaria.
In June 2021 Assoc. Dr. Balushev defended his dissertation **on the topic: "** Energy Transport in Optically Created Densely Populated Organic Triplet Ensembles **"** and in the same year he was awarded the scientific degree Doctor of Physical Sciences

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List of publications of Stanislav Balushev, associate professor of the Ministry of Education for participation in the competition for "professor" 4.1. Physical Sciences (Physics of Atoms and Molecules)...,

announced in SG No. 24/17/03/2023, page 58.

Names : Baluschev , Stanislav (scientific publications ; German spelling)

Names : Balouchev , Stanislav (in legal documents , patents ; French spelling)

ORCID ID: https://orcid.org/0000-0002-0742-0687

h (Web of Science): 26

h (Google Scholar): 29

P1. Shin-ichiro Kawano , Ch . Yang , M. Ribas , S. Baluschev , M. Baumgarten , and K. Müllen " Blue Emitting Poly (2,7-pyrenylene)s: Synthesis and Optical Properties ", Macromolecules 41, 7933–7937, 2008.

P2. S. Hess , M. Demir , V. Yakutkin , S. Baluschev , G. Wegner , " Investigation of Oxygen Permeation through Composites of PMMA and Surface-Modified ZnO Nanoparticles ", Macromol . Rapid Commun . 30, 394–401, 2009.

P3. RE Keivanidis , S. Baluschev , G. Lieser , G. Wegner , " Inherent Photon Energy Recycling Effects in the Up- Converted Delayed Luminescence Dynamics of Poly (fluorene) -Pt (II) octaethyl Porphyrin Blends ", ChemPhysChem 10 (13) 2316−2326, 2009.

P4. VA-F. Deichmann, V. Yakutkin , S. Baluschev , and L. Akcelrud " Optical Tuning of the Fluorescence Spectrum of a π- Conjugated Polymer through Excitement Power " J. Phys . Chem . B , 115 (20) 6385-6394, 2011.

P5. D. Busko , S. Baluschev , D. Crespy , A. Turshatov , K. Landfester , "New possibilities for materials science with STED microscopy ", Micron 43, 583–588, 2012. doi:10.1016/j.micron.2011.10.003

P6. R. Sauer , A. Turshatov , S. Baluschev , K. Landfester , " One-Pot Production of Fluorescent Surface-Labeled Polymeric Nanoparticles via Miniemulsion Polymerization with Bodipy Surfmers ", Macromolecules 45, 3787−3796, 2012

P7. MA Filatov , E. Heinrich , K. Landfester and S. Baluschev , " meso-Tetraphenylporphyrin with asystem extended by fusion with anthraquinone ", Org . Biomol . Chem ., 2015, 13, 6977-6983.

P8. M, A. Filatov , F. Etzold , D. Gehrig , F. Laquai , D. Busko , K. Landfester , and S. Baluschev , " Interplay Between Singlet and Triplet Excited States in a conformationally Locked Donor-Acceptor Dyad ", Dalton Transactions 2015, 44, 19207–19217.

P9. A. Vasilev , S. Baluschev , D. Cheshmedzhieva , S. Ilieva , OD Castano , JJ Vaquero ,

S. Angelova , and K. Landfester , “ Assembly of New Merocyanine Chromophores with a 1,8-Naphthalimide Core by a New Method for the Synthesis of the Methine Function ”, Aust . J. Chem . 2015, 68, 1399–1408.

P10. AJ Svagan , CB Koch, MS Hedenqvist , F. Nilsson , G. Glasser , S. Baluschev , M. L. Andersen, “ Liquid-core nanocellulose-shell capsules with tunable oxygen permeability ”, Carbohydrate Polymers 2016, 136, 292–299.

P11. A. Vasilev , M. Kandinska , S. Stoyanov , S. Yordanova , D. Sucunza , J. Vaquero , OD Castaño , S. Baluschev and S. Angelova , “ Halogen-containing thiazole orange analogues – new fluorogenic DNA stains ”, Beilstein J. Org . Chem . 2017, 13, 2902–2914.

P12. K. Katta , D. Busko , K. Landfester , S. Baluschev , and R. Muñoz-Espı , “ Inorganic Protection of Polymer Nanocapsules : A Strategy that Improve the Efficiency of Encapsulated Optically Active Molecules ”, Isr . J. Chem . 2018, 58, 1356–1362.

P13. K. Katta , D. Busko , Y. Avlasevich , K. Landfester , S. Baluschev and R. Muñoz-Espí , " Ceria / polymer nanocontainers for high-performance encapsulation of fluorophores ”, Beilstein J. Nanotechnol . 2019, 10, 522–530.

P14. M. Kandinska , S. Kitova , V. Videva , S. Stoyanov , S. Yordanova , S. Baluschev , S. Angelova , A. Vasilev , " Precious metal-free molecular machines for solar thermal energy storage ”, Beilstein J. Org . Chem . 2019, 15, 1096–1106.

P15. Olga Zhytniakivska , Mykhailo Girych , Valeriya Trusova , Galyna Gorbenko , Aleksey Vasilev , Meglena Kandinska , Atanas Kurutos , Stanislav B. Baluschev , “ Spectroscopic and molecular docking studies of the interactions of monomeric unsymmetrical polycationic fluorochromes with DNA and RNA", Dyes and Pigments 2020, 180, 108446:10.

P16. N. Nazarova , Y. Avlasevich , K. Landfester , and S. Baluschev , " All-Optical Temperature Sensing in Organogel Matrices via Annihilation Upconversion ”, ChemPhotoChem 2019, 3, 1020–1026.

P17. Banu Iyisan , Raweewan Thiramanas , Nadzeya Nazarova , Yuri Avlasevich , Volker Mailänder , Stanislav Balushchev , and Catherine Landfester , “ Temperature Sensing in Cells Using Polymeric Upconversion Nanocapsules ” Biomacromolecules 2020, 21, 4469−4478

P18. Aleksey Vasilev , Ralitza Dimitrova , Meglena Kandinska , Katharina Landfester and Stanislav Baluschev , “ Accumulation of the photonic energy of the deep-red part of the terrestrial sun irradiation by rare-earth metal-free E–Z photoisomerization ” J. Mater . Chem . C, 2021, 9, 7119–7126

P19. Ernesta Heinrich , Yuri Avlasevich , Katharina Landfester and Stanislav Balushchev , How _ that minimize light – organic matter interaction for all-optical subcutaneous temperature sensing " ACS Omega 2021, 6, 18860−18867.

P20. MIKandinska , DVCheshmedzhieva , A. Kostadinov , K. Rusinov , M. Rangelov , N.Todorova , S.Ilieva , DPIvanov , V.Videva , VSLozanov , S.Baluschev , K.Landfester , AAVasilev „ Tricationic asymmetric monomeric monomethine cyanine dyes with chlorine and trifluoromethyl functionality – Fluorogenic nucleic acids probes " Journal of Molecular Liquids 2021, 342, 117501.

P21. Banu Iyisan , Johanna Simon , Yuri Avlasevich , Stanislav Balushchev , Volker Mailaender , and Catherine Landfester , “ Antibody-Functionalized Carnauba Wax Nanoparticles that Target Breast Cancer Cells ” ACS Appl . Bio Mater . 2022, 5, 622−629

P22. Iva Zonjić , Marijana Radić Stojković , Ivo Crnolatac , Ana Tomašić Paic , Silvia Pšenićnik , Aleksey Vasilev , Meglena Kandinsky , Mihail Mondeshki , Stanislav Balushchev , Catherine Landfester , Ljubica Glavaš-Obrovac , Marijana Jukić , Juran Kralj , Anamaria Brozovic , Lucija Horvat , Lidija-Marija Tumir , Styryl dyes with N- Methylpiperazine and N- Phenylpiperazine Functionality : AT-DNA and G- quadruplex binding ligands and theranostic agents ", Bioorganic Chemistry , J. Phys . Chem . B,

P23. S. Marx , S. Baluschev , W. Sickenberger , “ Solution-related in Vitro Dewetting Behavior of Various Daily Disposable Contact Lenses ”; Optometry and Vision Science, 2022, 99 (10), 750 – 757,

P24. Aleksey Vasilev , Anton Kostadinov , Meglena Kandinska , Katharina Landfester and Stanislav Baluschev , “ Tetrathienothiophene Porphyrin as a Metal-Free Sensitizer for Room-Temperature Triplet-Triplet Annihilation Upconversion ”, Frontiers in Chemistry 2022, 10:809863,

P25. Maria Micheva , Stanislav Balushchev and Catherine Landfester , “ Thermally activated delayed fluorescence in an optically accessed soft matter environment ”, J. Mater . Chem . C , 2022, 10, 4533–4545,

Stanislav Balushev , associate professor of medical sciences, in co-authorship with world-renowned physicists and chemists such as Gerhard Wegner , Klaus Mühlen , Shin-ichiro Kawano from the Sony concern, Katarina Landfester , M. Baumgarten from MPI Polymerforschung Mainz as well as Nadzeya Nazarova , Yuri Avlasevich , Volker Mailänder , AJ Svagan , CB Koch, MS Hedenqvist , F. Nilsson , G. Glasser , L. Andersen, and others. The selection of a team of highly qualified

scientists from different countries is of crucial importance for the success of Prof. Balushev . The participation of Bulgarian scientists and doctoral students in all publications is also essential. I would like to note the fruitful cooperation of Assoc Balushev with Assoc. Dr. Alexey Vasilev from the

Faculty of Science of SU, which is expressed in numerous publications and participation in conferences and congresses.

I pay particular attention to publication P26, which in my opinion is particularly important for several reasons, and I recommend the candidate to publish it in Bulgarian so that it can be understood by a wider audience of physicists and chemists . The total number of publications according to the SU Authors system is 86. In all articles, the candidate's contribution is substantial!

Prof. Balushev 's publications are in journals with a high impact factor such as: ", J.

Mater . Chem . C, Frontiers in Chemistry , Bioorganic Chemistry , Journal of Molecular Liquids , Biomacromolecules , Optometry and Vision Science, ChemPhotoChem , ", Dalton Transactions , Macromolecules , Chem Phys Chem .

P26. S. Baluschev , Chapter 8, " Protective Strategies Towards Long-Term Operation of

Annihilation Photon Energy Upconversion ", JS Lissau , M. Madsen (eds .), Emerging

Strategies that Reduce Transmission and Thermalization Losses in Solar Cells , 149-167,

Springer Nature Switzerland AG 2022 ISBN: 978-3-030-70357-8

The candidate has indicated that in the last 2 years - 2021 / 2022 - he is the lead author in 6 articles, after a PhD thesis, he has published a total of 9 scientific communications.

I draw your attention to the fact that in P26, which is a chapter of a book, Dr. Prof. Balushev gave a summary that gives a great idea of my entire scientific work, I quote:

triplet-triplet process annihilational up -conversion (TTA-UC),

performed in a soft matter environment, is based on optically created densely populated

organic triplet ensembles. In the soft matter matrix it is diffusive

controlled process that simultaneously demonstrates essential

dependencies on the parameters of the environment, such as temperature of the matrix, viscosity of

the matrix and presence of molecular oxygen dissolved in the solvent or

adsorbed on the polymer film. It is important to note that all of these

environmental parameters are highly interrelated and their influence on

the time evolution of densely populated triplet ensembles is not linear

a combination of their partial effects. If the TTA-UC process is applied in

databases with scientific information (Web of Science and Scopus), Outside the habilitation work. Articles **68** - **90** of Table B3 (without articles **85** , **86**)
Published book chapter or collective monograph solar energy storage and/or conversion technologies, the impact of

the generation of singlet oxygen usually results in a lower quantum yield

(QY) and simultaneously to accelerated aging of the conversion device.

The generation of singlet oxygen is much more harmful to the studied object if

the TTA-UC process is used as a sensing mechanism to explore the local

temperature / local oxygen content in cell cultures. In this chapter,

addresses the development of an effective strategy to protect against extinction by

molecular oxygen and protection against subsequent photo-oxidation caused by

singlet oxygen. I definitely think this is a summary of his work and publication in a leading global publishing house, Springer Nature Switzerland AG 2022 S. Baluschev , Chapter 8, “ Protective Strategies Towards Long-Term Operation of Annihilation Photon Energy Upconversion ”, JS Lissau , M. Madsen (eds .), Emerging Strategies that Reduce Transmission and Thermalization Losses in Solar Cells , 149-167. https://doi.org/10.1007/978-3-030-70358-5_8.

I consider this book chapter as a thesis that deserves special attention.

The review of the Authors - Database for the scientific activity of Sofia University "St. Kliment Ohridski" showed that there is a complete correspondence between the lists presented by the candidate and the official database.

S P R A V K A
for the fulfillment of the minimum national requirements under Art. 2b of ZRASRB
Indicator number and content
Group of indicators A
50 3-diploma-D.pdf
Group of indicators B
100 4-diploma-DN.pdf
Group of indicators B
100 Appendix 1
total group of indicators B 100 Group of indicators D
495
15
total group of indicators D 510 Group of indicators D
308
for a scientific field ... Physics - professional direction *4.1. Physical Sciences - Physics of atoms and molecules* From Associate Professor Stanislav Balushev Balushev ... - candidate for the academic position of professor number of points
Application number with achievement data and number of indicator points*
Indicator 1: Dissertation work for the award of the educational and scientific degree "Doctor"
Indicator 2: Dissertation work for the award of the scientific degree "Doctor of Science"
Articles, 85 , 86, 91 , 92 , from Table B3
Scientific publications in publications that are referenced and indexed in world-renowned journals
93 of Table B3
Citations in scientific publications, monographs, and patents, referenced and indexed in world-renowned databases of scientific information (Web of Science and Scopus)
Quotes
191 - 345
From Table B4
total group of indicators D 308 Group of indicators E
75 4-diploma-DN.pdf
40
40
100
200
Obtained scientific degree "Doctor of Sciences"
Participation in a national scientific or educational project
Yes, DFNI E02/11

SunStore KP-06-PN-39/1
BIRDCagE KP-06-PN-39/11
SOFIa KP-06-DK3/1
COVIDAvir
Participation in an international scientific or educational project
Yes, 7 th FP: # 227127: EphoCell
Management of the Bulgarian team in an international scientific or educational project
Yes, # 3075 (SONY)-NIS # 3499 (SONY)-NIS
Horizon 2020 Grant # 732794: HypoSens
Funds raised for projects managed by the Applicant
projects managed by the candidate Yes, WG 02/2-2010
01.10.2010
BGN 120,000 KP-06-H37/15
06.12.19
BGN 120,000 H2020 # 732794:
HypoSens 11/10/2016
401,000 EUR
3075 (SONY)-NIS
3499 (SONY)-NIS
06.12.19
60,000 EUR
total group of indicators E 455
Successfully defended Diploma
R.D., defended on 14.06.2011
Z.P., defended on 14.06.2011
I.I., defended on 15.06.2011
M.M., defended on 15.06.2020
A.K., defended on 19.11.2019
* Scientific publication data must include a full bibliographic description of the publication (including a full list of authors) plus the name of a database referencing and indexing the relevant publication (for scientific publications in publications referenced and indexed in world-renowned databases of scientific information)
The above table shows, the candidate exceeds the requirements for the academic position.

The candidate has submitted the Summaries of the peer-reviewed publications from P1 to P26 in Bulgarian and English languages, including the book chapter (P26)

Citations (per professor) more than 400.
ORCID ID : https://orcid.org/0000-0002-0742-0687
***h* - index** (*without self-citations*) **: 28** **Times Cited** (*without self-citations*): **2763**

CONTRIBUTIONS – the applicant has presented 6 main contributions as follows:
P1 . One of the experimental directions of Balushev 's group is the molecular design *and* synthesis of new blue-emitting organic semiconductor molecules. (*i) A 2,7-conjugated* polypyrene containing 4 aryl groups [P1] was synthesized for the first time . This blue emitter exhibits emission with a maximum at X = 429 nm and a strong fluorescence dependence on the local polarity of the solvent; (*ii*) In another experiment, the photophysical properties of the conjugated blue-emitting polymer synthesized by our group consisting of alternatively alternating 2,20- bipyridyl- and 2,5-dihexyl-oxyphenylene groups (PBPyDHP) were

investigated as a function of the experimental parameters (solvent type, molar concentration, dissolved oxygen concentration and pumping intensity) [P4]; (*iii) In another experiment, a molecule possessing simultaneously the functionalities of surface activity,* polymerizability and fluorescence emission was synthesized [P6]. A sufficiently long hydrocarbon chain ending in methacrylamide has been covalently linked to a mono- or bisulfonated BODIPY - core (surfmer , combination of surfactant and monomer). The performed time-resolved fluorescence spectroscopy proved a strong dependence of the fluorescence emission on the polarity of the medium, allowing the quantification of the association and/or aggregation of synthetic or natural macromolecules on the surfmer surface. nanoparticle .

P2 . One of the main research goals of Balushev 's group is the synthesis of dyes with an original structure and with pronounced properties for testing by a fully optical method the physiological parameters of organic samples. (*i*) Such an example is the successful synthesis of a new family of merocyanine dyes [P9] with strong solvatochromism . An outstanding achievement is the ability to optically distinguish the presence of methyl alcohol or ethyl alcohol in an aqueous environment. This bio-optical sensor complex can be naturally incorporated into the global idea of creating a minimally invasive technology for controlling the physiological parameters of cell cultures; (*ii*) Another example [P11] is synthesizing (original, unpublished

dye Ba^{2+} complexes (without the presence of rare-earth metal ions) and excited optically with light, substantially red-shifted, by combining the processes of EZ photoisomerization and triplet-triplet annihilational *up* - conversion. structures so far), of a family of cationic asymmetric monomers monomethine-cyanine dyes decorated with halogen **-containing substituents. The** newly synthesized dyes have analogous binding behavior to double - stranded DNA (dsDNA) similar to the commercially available thiazole orange (TO) dye. All dyes tested demonstrated fluorescence with vanishing intensity when dissolved at a molar concentration of 5x10'6 M, TE -buffer. When dsDNA is present in the solution, complexes - *cdpDNO* are formed - *dsDNA and* the fluorescence intensity increases by more than 2 orders of magnitude. A direct comparison was made with the commercially approved TO dye for DNA studies, as the newly synthesized monomethine-cyanine dyes demonstrate substantially higher sensitivity; (***iii***) A further experimental step in this direction was the synthesis of asymmetric di- and tri- cations monomethine cyanine dyes [**P15**]. By applying combined spectroscopic methods, the behavior of these dyes in the presence of nucleic acids was investigated: the changes in the absorption and fluorescence spectra proved the preferential binding to the double-stranded DNA molecule compared to the binding to the single-stranded RNA molecule; (***iv***) In a subsequent experiment, the family of tricationic asymmetric monomethines cyanine dyes are enriched with the cyanine dyes synthesized by his group with chlorine- or trifluoromethyl functionality. Spectroscopic studies [**P20**] have shown that the fluorescence signal from chlorine-containing cyanine dyes increases more than 110-fold upon binding of the dye molecule to the single-stranded RNA molecule.

P3 **.** One of the directions in his group is the synthesis of completely organic dyes (without inclusion in their structure of rare earth or noble metal ions) demonstrating photoinduced *trans-cis* isomerization at low optical excitation intensities . (***i***) An example of such molecules are the one synthesized by his

group family of styryl dyes containing benzothiazole-crown ether [**P14**]. Time evolution of *trans- KbM -cis* photoisomerization were monitored in real-time mode. The newly synthesized dyes demonstrated very low intrinsic fluorescence of *the dye-B* $a^{2\ complex}{}_{+}$ *and* at the same time a long lifetime (more than 500 s) of the high-lying energy form of the EZ - complex, with photoisomerization occurring at extremely low excitation intensity.

P4 . The optically excited triplet states of the sensitizing organic molecules represent an energy reservoir for subsequent emission processes, such as residual phosphorescence (at

temperatures close to the physiologically important temperature of 36°C) or delayed fluorescence (resulting from the triplet - triplet process the annihilation *up* -conversion). The presence of an intersystem- crossing coefficient with a substantially large value is a mandatory condition for the formation of a densely populated triplet ensemble, after the absorption of a single photon (strictly linear mode of incoherent excitation). (*i*) Energy transfer processes in a densely populated triplet ensemble formed in PF26:PtOEP thin polymer films were investigated following the modified Stern-Volmer formalism [P3];

P5 . A major goal of the group's research is the study of the triplet-triplet process annihilational *up* -conversion (TTA-UC) in multicomponent organic media. One of the critical conditions for studying the dynamic characteristics of the TTA-UC process is the stable and reproducible control of oxygen diffusion (in the ground state) in a soft matter (with different structure, composition and sample architectures) serving as an encapsulation barrier material of the optically active molecules. (*i*) A substantial increase in the barrier properties of a PMMA/ ZnO [P2] -based nanocomposite material is shown ; (*ii*) In another experiment, we synthesized nanocomposite capsules, with a liquid hydrophobic core (hexadecane) with a diameter of approximately 1.66 ± 0.35 pm. When mixed with TEMPO-NFC suspension , they were able to obtain large (8.3 ± 2.5 pm) capsules with a high surface concentration of nanocellulose .

P6 . Assoc. Prof. Balushev shows that the TTA-UC process depends drastically on changes in environmental parameters - local temperature, local concentration of oxygen in the ground state, viscosity of the medium and the associated (indirectly) local mobility of organic molecules , building *the w^* - conversion pair *and* the presence (at distances comparable to the diffusion length of the singlet oxygen molecule) of singlet oxygen consumers (sacrificial singlet oxygen scavenger). In subsequent experimental works, have demonstrated the application of the TTA-UC process as a fully optical testing mechanism for the physical parameters of biological samples. A general characteristic of the testing technology based on the TTA-UC process is: •) the low excitation intensity (of the order of 50 mWxcm $^{-2}$); •) optimal selection of the temperature interval with the greatest sensitivity (better than 100 mK) - centered around T=36°C (physiological temperature); •) ratiometric type of optical response, allowing substantial independence of the measurement from instability of the excitation intensity, local fluctuations of the molecular concentration, thickness of the polymer layer, size of the nanoparticle ; •) creation of calibration curves, without hysteresis ; •) organic materials (with the predominant mass) in the test structures are approved as food additives; (*i*) These features of the TTA-UC process used for all-optical temperature testing in organogels containing the energetically optimized sensitizer/emitter pair were demonstrated in [P16]. The temperature sensitivity in the carnauba wax /rice husk oil (RBO) organogel was better than 100 mK , for a temperature range of DT = 15°C to 45°C, as the ratio of the residual phosphorescence intensity of the sensitizer (rPh) to the emitter delayed fluorescence intensity (dF) changes more than 15 times (dF / rPh =15); (*ii) Penetration of light under human skin is* severely limited both by the optical absorption of oxygenated hemoglobin and by optical losses caused by skin is severely limited both by the optical absorption of oxygenated hemoglobin and from optical losses caused by scattering from white adipose tissue (WAT). Accordingly, the escape of light from human skin (ie, the emission of residual phosphorescence and delayed fluorescence) creates even greater experimental problems. This non-trivial problem has been successfully solved in the group by synthesizing the family benzo - naphtho palladized porphyrins (sensitizers, with maximum absorption wavelength, 1 = 660 nm) *and* asymmetric monophenylmonobenzo BODIPY (an emitter energetically optimized to the triplet level of the sensitizer family, with a maximum at the fluorescence wavelength, 1 = 630 nm), [P19]. All three light waves - i.e. excitation wavelength 1 = 660 nm, both information carrier waves - delayed fluorescence, 1 = 630 nm and residual phosphorescence = 850 nm optimally coincide with the first window of transparency of human skin (tissue), AH = 600-900 nm). The temporal evolution of the densely populated organic triplet ensembles demonstrates the complexity of the problem under consideration, as the conceptual and experimental solutions proposed by the group **of Stanislav Balushev , associate professor of science , are presented .**

Lecture workload. Assoc _ In the last 5 years, Balushev has an average workload of around and over 500 hours, which is above the average for FF of SU. All this gives me reason to confidently assert that he is not only a good scientist but also a good lecturer who has enough students and doctoral students

Head of the Optometry Master's Program

of lectures for the students of the Master's and Bachelor's Programs in Optometry :
1. Wave Optics (45 hours).
2. Interaction of Organic Matter with Light (45 hours).
3. Photoadaptation Mechanisms (45 hours).
For the students of MP Photonics
1. Organic Optoelectronics (45 hours)

Conclusion

After having familiarized myself with the presented materials, and based on the analysis of their significance and the scientific and scientific-applied contributions contained in them, I **confirm** that the scientific achievements meet the requirements of ЗРАСРБ and the Regulations for its application and the relevant Regulations of the SU " St. Kliment Ohridski" **for acquiring the academic position " Professor"** . In particular, the candidate satisfies the minimum national requirements in the professional direction and no plagiarism has been found in the scientific works submitted for the competition.

I give my **positive** assessment of the presented materials for acquiring the academic position "Professor".

2. Critical notes and recommendations

In reviewing the present materials, I found no significant errors regarding: staging; analyzes and summaries; methodological level; accuracy and completeness of results; literary awareness. I found only inaccuracies of some forms in the spelling: quinoid instead of quinoid form, fluorine instead of fluorene and other minor spelling errors that do not spoil the excellent impression of the presented materials.

II . GENERAL CONCLUSION

Based on the above, I confidently **recommend it** to the esteemed scientific jury

to award the academic position "Professor" in professional direction 4.1 Physical Sciences, Physics of Atoms and Molecules to Stanislav Balushev , Associate Professor Balushev .

10.07.2023 Prepared the review:……..

(Prof. Dr. Tsonko Kolev)