

REFERENCE STATEMENT

within the call for

a Professor position

in 4.1. Physical sciences (Physics of atoms and molecules),

at Sofia University “St. Kliment Ohridski”,

Faculty of Physics, published in the Bulgarian State Gazette, vol. 24 from 17. 03. 2023

The reference statement is by: **Prof. Dr. Anela Nikolova Ivanova – Faculty of Chemistry and Pharmacy, Sofia University “St. Kliment Ohridski”, 4.2. Chemical sciences**, Chair of the scientific jury appointed with Order № RD-38-174 from 20. 04. 2023 of the Rector of Sofia University.

There is a **single applicant** for the position:

..... Assoc. Prof. Dr. Sci. Stanislav Balushev Balushev.....
..... Faculty of Physics, Sofia University “St. Kliment Ohridski”.....

I. General description of the application documents

1. Application data

The submitted application documents comply with the requirements of the Law for promotions in academia in Bulgaria (LPAB) and the statutes for its application.

Assoc. Prof. Dr. Sci. Stanislav Balushev Balushev has submitted for assessment 26 scientific publications, i.e. 25 research articles published in international peer-reviewed journals and 1 book chapter. All required documents supporting his research achievements are also available.

The documents are accurately prepared and contain the necessary information.

2. Applicant data

Stanislav Balushev has been awarded a PhD degree from the Faculty of Physics (FPh) of Sofia University “St. Kliment Ohridski” (SU) in 1998 after successful defense of a thesis titled "Phase modulation of light beams. Dark spatial solitons". In 2021 he has become “Doctor of Sciences” (Dr. Sci.) after presenting at SU, FPh a doctoral thesis "Energy transfer in optically generated highly populated organic triplet ensembles“. The applicant has been employed at SU, FPh since 2009 where he has occupied an Associate Professor position for the past 14 years, being Dr. Sci. for the past 2 years.

He has spent a material part of his research career abroad, mainly in Germany. Assoc. Prof. Balushev is a holder of prestigious Marie Curie fellowships. He has coordinated or participated in 10 international and 5 national research projects. He is among the inventors of 18 patents or patent applications.

3. General characteristics of the publications and research achievements of the applicant

Assoc. Prof. Balushev is a co-author of 78 scientific publications, all in international peer-reviewed journals (Source: *Scopus*). He has submitted for the selection procedure 26 publications, 23 thereof published after the PhD defense and after the Associate Professor appointment. He is the

corresponding author of 8 of the publications and the last author in 3 more of them. He has co-authored 9 articles after becoming Dr. Sci., in 6 of which he is the senior author.

Assoc. Prof. Balushev presents the following achievements to fulfill the minimum national criteria and the additional requirements of SU, FPh for occupying the Professor position:

- indicators group A - defended PhD thesis - 50 points out of minimum required 50
- indicators group B – awarded Dr. Sci. degree - 100 points out of minimum required 0
- indicators group C - 4 publications in Q1 journals, not included in prior competitions - 100 points out of minimum required 100
- indicators group D - 21 publications in international peer reviewed journals (15 in Q1 and 6 in Q2), 4 'golden' thereof, and 1 book chapter - 510 points out of minimum required 200
- indicators group E - 155 citations of the publications submitted for evaluation - 310 points out of minimum required 200
- indicators group F – Dr. Sci. degree, participation in 4 national and 2 international research projects, coordination of the Bulgarian team in 2 international research projects (with secured third-party funding) - 455 points out of minimum required 150

It is evident from the above summary that the applicant either fulfils or goes beyond the minimum national requirements in all groups of indicators. The overall scientific metrics is in compliance with the general requirements of LPAB, the statutes for its application, and the additional recommendations of SU, FPh.

The research of Assoc. Prof. Balushev is devoted to study and in-depth understanding of processes taking place in the excited states of photoactive compounds. The targets are various organic and metal-organic substances. Recently, attention has been paid also to incorporation of the active compounds into different nanocarriers either to protect them or to increase their efficiency. The developed materials are intended for application in: (i) sensitizers; (ii) optoelectronic devices; (iii) formulations for therapy or diagnostics.

Fluorescent dyes for optoelectronics have been devised (P1, P4, P6) – both small organic molecules and polymers, characterized primarily with blue emission and profound solvatochromism. The latter has been employed in the design, synthesis, and description of the optical properties of new merocyanine dyes (P9, P11, P15, P20, P22) to be applied as purely optical sensors in physiological conditions. It has been demonstrated that by tuning the molecular structure of the dyes they could be bound specifically to certain types of nucleic acids, thereby achieving multiple fluorescence enhancement.

The development of purely organic photoactive compounds with highly populated triplet excited states, which are then used as a source of delayed fluorescence by efficient intersystem crossing and upconversion (P3, P7, P8, P14, P18, P24), is an important contribution. The same strategy has been employed to perform E-Z isomerization or excitation transfer among various molecular fragments, aimed at either energy storage or sensibilization. Another essential part of the research (P2, P10, P12, P13, P21) is based on the process of triplet-triplet annihilation (TTA) utilized to accomplish desired performance of functionalized nanoparticles, including scavenging of the detrimental effect of molecular oxygen on photophysical processes. TTA has been used also for excita-

tion transfer in organic materials (P16, P19, P25, P26) to measure locally the temperature in living cells.

4. Evaluation of the teaching activities of the applicant

Assoc. Prof. Balushev has supervised four PhD (one defended successfully in 2022) and five successfully graduated diploma students. In the last five years, he has taught 531 academic hours on average.

5. Analysis of the research achievements of the applicant submitted for the call

The field of competence of the applicant, which he has applied in the research described above, is steady-state and time-resolved photoluminescence spectroscopy. Assoc. Prof. Balushev has established himself over the years as a specialist in these measurements with versatile applicability.

He also maintains intensive international collaborations. A significant share of his scientific investigations has been carried out together with colleagues from Germany, often during visits on the spot. This undoubtedly contributes to the quality and diversity of his research. Assoc. Prof. Balushev collaborates with scientists from the Faculty of Chemistry and Pharmacy of Sofia University and from the Bulgarian Academy of Sciences, too. It is noteworthy that the applicant has a leading role in his research activities, pursuing his own ideas by supervising young researchers, but also working within larger teams.

The contribution of Assoc. Prof. Balushev to the research submitted for evaluation, is clearly outlined in the provided contributions summary. His share is significant and varies from carrying out the experiment to analyzing the experimental data. It may be concluded that the performed research has resulted in development of new functional materials by non-conventional molecular design and synthesis, thereby employing state-of-the-art photophysical processes. This enriches the existing knowledge in the selected research area, which is within the specification of the call.

The scientific publications of the applicant have appealed to the scientific community, which is confirmed by 2663 independent citations. The publications submitted for evaluation have been cited 155 times at the moment of application. The research outcome has been disseminated at 35 scientific events, most of them abroad, with 27 oral (2 plenary talks) and 8 poster presentations. The h-index of Assoc. Prof. Balushev is 28.

6. Critical notes and recommendations

The submitted materials represent high quality research on up-to-date problems carried out in an international environment. No critical notes are due. I would recommend the applicant to continue working with students and enticing them for PhD at SU, FPh.

7. Personal opinion of the applicant

I have known the applicant for more than twenty years and when discussing scientific topics with him he has always impressed me as a devoted researcher with original ideas. He combines his individuality with successful team work. He integrates well into the dynamic European research community.

8. Conclusion about the application

In summary, after analyzing the materials submitted for the evaluation, **I confirm that** they comply with all requirements of the law and with the additional recommendations of SU, FPh for a

Professor position in the area of the call. The applicant fulfils the minimum national criteria in this area and no plagiarism has been established in the materials submitted for the call.

This motivates me to assess **positively** the applicant.

II. GENERAL CONCLUSION

Based on the above, **I recommend** the scientific jury to nominate to the selection body of the Faculty of Physics of Sofia University Assoc. Prof. Dr. Sci. Stanislav Balushev Balushev to be appointed as a Professor in 4.1. Physical sciences (Physics of atoms and molecules).

July 11, 2023

Author of the reference statement: Prof. Dr. Anela Ivanova