

REFeree REPORT

**Call for academic position "Associate professor"
Scientific strand: 4.1 Physics Sciences (Experimental nuclear physics)
Faculty of Physics, University of Sofia "St. Kliment Ohridski"
announced in State Gazette no. 103 of 10.12.2021**

This report is prepared by Assoc. Prof. Dr. Kalin Angelov Gladnishki, Faculty of Physics, University of Sofia, as a member of the scientific jury for selection of an Associate professor in: 4.1. Physics Sciences (Experimental nuclear physics) according to Document No. PД38-38 /20.01.2022 of the Rector of the University of Sofia.

A single candidate has submitted documents to participate in the announced call

Head Assistant Prof. Dr. Strahil Boychev Georgiev, Faculty of Physics at the University of Sofia.

I. General description of the submitted materials

1. Application Details

For participation in the competition, the candidate **Strahil Boychev Georgiev** has submitted a list of 19 publications, all of which are published in international peer-reviewed and indexed journals with an impact factor. Five of them are publications in journals with quartile Q1 and thirteen in issues with quartile Q2. One of the presented publications is published in a journal with quartile Q3.

The documents, submitted by the applicant, comply with the Bulgarian national requirements and rules for acquiring science degrees and holding academic positions at the University of Sofia "St. Kliment Ohridski" (PURPNSZADU).

2. Candidate Details

In 2003, Strahil Boychev Georgiev graduated from the University of Sofia "St. Kliment Ohridski", Faculty of Physics, and obtained bachelor's degree in physics.

The next step in the education of Strahil Georgiev was the acquisition of the educational - qualification degree "Master" in 2005, in the specialty "Medical Physics" at the University of Sofia "St. Kliment Ohridski".

In the period 2007-2012, he pursued a Ph.D. degree at the Department of Atomic Physics, Faculty of Physics at the University of Sofia "St. Kliment Ohridski". In 2012, Strahil Georgiev successfully defended his dissertation and received his Ph.D. degree in nuclear physics from the University of Sofia "St. Kliment Ohridski".

The career development of Head Assistant Professor Dr. Strahil Boychev Georgiev until the present was as follows:

In the period 2004-2013, Dr. Georgiev held the position of "physicist" at the "Experimental Nuclear Physics" laboratory at the Department of Atomic Physics of the Faculty of Physics at the University of Sofia "St. Kliment Ohridski" and from 06.2006 to 12.2006 was on leave for military service.

In 2013, he won a competition for head assistant at the Department of Atomic Physics, at the University of Sofia "St. Kliment Ohridski", which position he still holds.

3. Characteristics and analysis of the candidate's scientific works and achievements

The main scientific interests of Dr. Strahil Georgiev are in the field of experimental nuclear physics and are related to the development of methods and tools for measuring radioactive noble gases (RNG). A total of 19 publications were presented for the competition, including 18 in journals with Q1 and Q2, and one was published in a journal of group two (Q3).

3.1) Comparison of the applicant's indicators with the requirements for holding the academic position of Associate Professor

a) National requirements - S. Georgiev meets the minimum national requirements (aka points) for holding the academic position of associate professor, adopted by the "Rules for the Implementation of the Law for the Development of Academic Staff in the Republic of Bulgaria" (PPZRASRB) on 19.02.2019.

For the current competition, the candidate submits 19 publications, based on which the candidate receives the following points: 50 from group A, 105 from group Б (according to Indicator 4), 295 from group Г (according to Indicator 7), 170 from group Д, 110 from Group E. The points scored by Dr. Georgiev cover the national minimum requirements for holding the academic position "Associate Professor" for each of the groups, and in some cases exceed them.

b) Additional requirements - S. Georgiev's indicators meet the Additional requirements of the Faculty of Physics of the University of Sofia, adopted on 29.01.2020

Dr. Georgiev also presented data on the criteria of the additional requirements of the Faculty of Physics of the University of Sofia. The number of publications in groups of indicators B and Г, with a significant contribution of the candidate - 4; publications from the last 3 years - 6; teaching experience for the last five years - 3618 hours (3618: 7 = 723.6 hours per year at a

requirement of ≥ 540); supervisor of 3 diploma theses; the candidate's Hirsch index is $h = 5$. From the data shown it is clear that the additional requirements of the Faculty of Physics for the position of "Associate Professor" are met in all indicators.

As a summary of the review, the following can be concluded:

- the scientific works meet the minimum national requirements of ZRASRB and the additional requirements posed by the University of Sofia "St. Kliment Ohridski" for holding the academic position of "Associate Professor" in the scientific field and professional direction of the competition;
- there is no legally proven plagiarism in the scientific papers submitted by the applicant.

3.2) Scientific Research

Dr. Georgiev's research activities can be broadly divided into four main groups depending on the direction of the research included in them:

- I. Development and practical application of methods for measuring ^{222}Rn and ^{220}Rn , based on the formation of traces of alpha particles in CD / DVD.

The applicant's contributions on this topic are related to the development and practical application of the CD method which combines the high radon absorption capacity of polycarbonate (based on Bisphenol-A), from which CD/DVD is made, and the particles' track properties in this material. The candidate's contributions include participation in the planning, preparation, and conducting of CD/DVD irradiation experiments; CD/DVD processing and analysis; estimation of radon concentrations from CD/DVD measurements; analysis of experimental results; participation in the preparation and editing of the texts of the publications as well as the figures for them.

- II. Development, and practical application of methods for measuring radon and other radioactive noble gases (RNG) based on absorption in polymers.

The publications in this group are devoted to studying methods based on the absorption of RNG in different polymers and different approaches to measuring the absorbed activity. The advantages of approaches based on the absorption of RNG in polymers are related to the ability to concentrate and retain RNG in the polymer. The development of such methods requires a quantitative description of the processes of absorption and desorption of RNG in polymers. A method has been proposed for measuring ^{222}Rn and ^{85}Kr in air or water by absorption in polycarbonate granules and subsequent liquid scintillation (TC) counting by mixing the granules with a TC cocktail. This is the first method to combine the ability to concentrate RNG in a polymer with the high efficiency of TC counting in the detection of alpha and beta particles.

A method for direct TC-measurement of radon being absorbed in polycarbonate granules without the addition of TC-cocktail is also proposed (the method is less sensitive than those with TC-cocktail). The granules can be used repeatedly after decomposition/desorption of radon from them without generating chemically hazardous waste. This makes the method very suitable for mass measurements of radon at expected relatively high concentrations, e.g. soil gas or short-term irradiation at high concentrations when calibrating passive detectors.

Of interest is also a proposed method for studying the depth profile of radon in soil gas. In this method, holes are drilled in a solid rod at a certain distance and thin polycarbonate foils are placed in them. The advantage of these measurements is that they do not change the profile of radon in the soil. Strahil Georgiev's contributions to this publication include the production of a rod with holes for polycarbonate films.

In all articles related to this group of studies, Dr. Georgiev participated in the planning, preparation, and conducting of the experiments. He took part in obtaining and analyzing the experimental results, as well as in preparing and editing the texts of the publications and the figures for them.

III. Investigation of the RNG absorption properties of polymeric materials, including plastic scintillators. Development of methods for determining the partition coefficient and diffusion length of RNG in polymers.

This group of publications is devoted to methods for characterizing the absorption properties of polymers by determining the partition coefficient K and the length of LD diffusion of RNG in them. What these methods have in common are several main steps outlined as follows. As a first step, irradiation of samples with well-defined geometry and dimensions in an environment containing RNG is carried out. The next step after cessation of irradiation is to wait for the samples to desorb in the air with the lowest possible RNG concentration. Next is the construction of the time dependence of the measured activity during desorption and its approximation with a theoretical model, which determines the parameters of the model - diffusion length and distribution coefficient. The wide range of values of these parameters, as well as other physical characteristics of the polymer samples, do not allow the application of a universal approach to studying the time dependence of activity, which requires the development of different methods applicable in different cases.

The candidate's contributions to this group of publications are the planning, preparation, and conducting of experiments, the development, validation, and calibration of some of the proposed methods. Also, active participation in the analysis of the experimental results, preparation and editing of the text of the publications, and the figures for them.

IV. Development and validation of approaches to reduce temperature shift in radon detectors with anti-thoron polymer membranes.

This group includes only one paper, which offers three approaches based on the protection of polymer membrane detectors, using the results for K and LD obtained in a previous paper of the candidate. The paper adopts and adapts a theoretical model describing the process of transport of radon across the membrane into and out of the detector volume. The model is the basis of the three approaches and allows, by selecting a suitable membrane, to reduce (or eliminate) the influence of the thoron and to evaluate and report the temperature effect on the response of the detector. In studies related to the transport of radon and thoron across the protective membrane, a detector system with a PIPS detector similar to the primary thoron standard in CEA/LNHB, France, was used. This system has been shown to be very suitable for studying the permeability of such membranes. Strahil Georgiev is the corresponding author of this publication. His contributions include research and adaptation of the theoretical model; examination and calibration of the PIPS system for measuring radon and thoron; planning, preparing, and conducting the experiments for research and validation of the three approaches; analysis of experimental results; preparation and editing of the text of the publication and the figures for it.

4. Characteristics and evaluation of the candidate's teaching activity

During all academic years as a teacher, the candidate had a full academic workload, leading a wide range of compulsory and elective courses (lectures, seminars, and laboratory exercises). The courses which he has been teaching are oriented both bachelor's and master's students at the Faculty of Physics at the University of Sofia. The scientific guidance of Head Assistant Professor Georgiev includes the successful defense of 3 diploma theses. As it can be seen, his teaching work is intensive, extensive in subject matter, and successful. In this regard, he is fully prepared to perform the duties of an associate professor.

5. Conclusion of the application

After reviewing the materials and scientific works presented and based on the analysis of their importance, and the scientific, and applied contributions contained therein, I confirm that the scientific achievements meet the Bulgarian national requirements, and the corresponding Rules by the University of Sofia "St. Kliment Ohridski" for holding of the academic position of Associate Professor. In particular, the applicant meets and exceeds all the minimum national requirements in the professional field and further, no plagiarism has been detected in the scientific papers submitted for the competition.

I definitely give my positive assessment of the application.

II. GENERAL CONCLUSION

On the basis of the mentioned above, I strongly recommend the Scientific Jury to propose to the Faculty Council of the Faculty of Physics, University of Sofia "St. Kliment Ohridski" to elect Head Assist. Prof. Dr. Strahil Boychev Georgiev for the academic position of Associate Professor in the professional strand 4.1 Physics Sciences (Experimental nuclear physics).

14.04.2022 г.
Sofia

Referee report prepared by.....
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