REVIEW

from Prof. Dr. Pavletta Stoyanova Shestakova
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on the materials presented for the competition
for the academic position of **"Associate Professor"**
at University "Prof. D-r Assen Zlatarov", Burgas

in the higher education field **4. Natural Sciences, Mathematics and informatics,** professional field **4.2. Chemical Sciences,** scientific specialty **"Analytical Chemistry (Instrumental analysis methods)"**

Senior Assistant Professor D-r. Lenia-Nezaet de Brito Gonsalvesh-Musakova from the University "Prof. d-r Assen Zlatarov", Burgas is the only candidate in the competition for the academic position of "Associate Professor" announced in the State Gazette, issue. 105 of December 11, 2020.

1. General presentation of the materials and of the Applicant

The set of materials presented by D-r. Gonsalvesh-Musakova is in accordance with the requirements of the Law for the Development of the Academic Staff in the Republic of Bulgaria, The Regulations for implementation of the Law and the Regulations for acquiring scientific degrees and academic positions at the University "Prof. D-r. Assen Zlatarov ", Burgas, and meets the criteria of the University" Prof. D-r. Assen Zlatarov ", Burgas for the academic position of " Associate Professor ".

D-r. Lenia-Nezaet de Brito Gonsalvesh-Musakova received her Bachelor degree at the Faculty of Chemistry, Sofia University "St. Kliment Ohridski " in 2003 and her Master degree in 2005, following the Master program in "Modern spectral and chromatographic analysis techniques". In 2005 she was appointed as a chemist at the Institute of Organic Chemistry with the Centre of Phytochemistry (IOCCP), BAS, and then successively held the academic positions of assistant (2006-2009) and senior assistant (2009-2015) at the same Institute. In 2012 she defended her doctoral thesis on " Sulphur and organic sulphur alterations in biodesulphurised law rank coals". The doctoral thesis was in the frame of a joint doctoral program between the Institute of Organic Chemistry with Centre of Phytochemistry, BAS and the University of Hasselt, Belgium, under the supervision of Assoc. Prof. Stefan Marinov from IOCCP, BAS and Prof. Jan Iperman from the University of Hasselt, Belgium. In 2015, Dr. Gonsalvesh-Musakova was appointed as a senior assistant at the University "Prof. D-r. Assen Zlatarov ", Burgas. In 2015, D-r. Gonsalvesh-Musakova was appointed as a senior assistant at the University "Prof. Assen Zlatarov ", Burgas.

D-r. Gonsalvesh-Musakova's main research interests are in the field of solid fuel chemistry and include a detailed characterization of geological samples and waste pyrolysis products by applying a wide range of instrumental methods and techniques for analysis, which is in line with the field and the professional direction of the announced competition. The overall scientific

activity of D-r. Gonsalvesh-Musakova has been summarized in 43 publications with her participation, of which 21 in peer-reviewed publications with impact factor (Scopus and Web of Science), 4 in proceedings of scientific conferences presented in Conference Proceedings in Thomson Reuters and / or Scopus and 23 in international or Bulgarian journals. Recognition of the significant contribution of the Candidate in the research field is the fact that in 49% of the publications D-r. Gonsalvesh-Musakova is the first author. The number of observed citations according to Scopus data is 166, and six of the publications have a τ1-index.

During her academic career D-r. Gonsalvesh-Musakova had international post-doctoral specializations at the University of Hasselt, Belgium (6 months, 2013-2014 and 2 months in 2014), within the project "Greenland: Gentle remediation of trace element contaminated land ", Funded by the 7th FP of the EU. Several short-term research visits were also carried out on joint research projects with the National Technical University of Donetsk, Ukraine and Sabanci University, Turkey.

For participation in the competition D-r. Lenia-Nezaet de Brito Gonsalvesh-Musakova has presented 18 scientific papers that are not included in her Doctoral Thesis. All 18 presented publications are accepted for evaluation, of which 4 are under indicator B4 and 14 are under indicator G7. The distribution of the journals in which the scientific papers for participation in the competition are published by the respective quartiles (Q factors) is as follows: Q1 - 6, Q2 - 4, Q3 - 2 and Q4 - 4. Of the 18 scientific papers presented, 16 have been published in impact factor journals (Scopus and Web of Science), 1 - in an international peer-reviewed journal (Web of Science) and 1 - in proceedings of scientific conferences presented in Conference Proceedings at Thomson Reuters and / or Scopus.

2. General characteristics of the Applicant's activities

Evaluation of scientific and applied research activities

The scientific interests and scientific contributions of D-r. Gonsalvesh-Musakova are in the field of solid fuel chemistry, with a focus on the development of environmentally significant approaches for their utilization, as well as on the application of a combination of modern instrumental and analytical methods for detailed characterization of the studied materials. Impressive is the wide range of analytical approaches, experimental strategies and instrumental techniques used by D-r. Gonsalvesh-Musakova, and, if necessary, further developed for the purposes of her research work. These include UV-VIS, MS, FTIR, TGA, TGA-MS, TGA-FTIR, GC/MS, Py-GC/MS, TD-GC/MS, HPLC, AP-TPR-MS, AP-TPR "off-line", TD-GC/MS). The interest of D-r. Gonsalvesh-Musakova in instrumental and analytical methods is evidenced by the various training courses and certificates for working with modern analytical equipment such as gas chromatograph with flame-ionization detector and thermal conductivity detector, scanning electron microscope, system for determining specific surface and pore distribution, high performance liquid chromatograph with different types of detectors, gas chromatograph with triple quadrupole mass spectrometer.

D-r. Gonsalvesh-Musakova presents an extended report on her scientific contributions, which systematically and clearly describes her main scientific achievements. The presentation of the scientific results is accompanied by a short discussion about the place of the respective

scientific developments in the respective scientific field and their contribution in solving specific current problems in the field. The scientific contributions of Senior Assistant D-r. Gonsalves-Musakova can be summarized in the following three main areas:

1. Investigation of the forms of organic sulfur and the composition of the organic matter of fossil solid fuels and other geological objects. Biodesulfurization;

The research related to this area occupies the most significant part of the scientific work of D-r. Gonsalvesh-Musakova and is summarized in 9 of the publications submitted for participation in the competition. The publications reflect research aimed at developing approaches for biodesulfurization of coal, as an opportunity to solve a number of environmental problems related to harmful emissions of SO_2, H_2S, CS_2, COS and volatile sulfur-containing organic compounds that are formed during coal combustion. The scientific contributions and achievements in this area can be summarized as follows:

- Assessment of the organic sulfur-containing pollutants released during the combustion of household briquettes produced from biomass and coal of different rank. A number of regularities have been established regarding the quantity and type of the registered organic sulfur functionalities depending on the type of briquettes (bio-briquettes, lignite briquettes, subbituminous and bituminous coal briquettes). The obtained data allow to make a preliminary analysis of the possible sulfur emissions during the combustion of the briquettes and to assess the possible environmental consequences.
- The changes that occur with sulfur functionalities, organic matter (OM) and fuel characteristics in biodesulfurization of coals of different rank by treatment with different microorganisms have been studied in detail. The obtained results represent one of the most in-depth and systematic studies on the biodesulfurization of coal as a promising method for the removal of organic sulfur. The obtained new knowledge contributes to the elucidation of the transformation of organic sulfur in coal and the mechanisms by which the process of biodesulfurization takes place, as well as to the assessment of the influence of the coal matrix on biodesulfurization. The results are a prerequisite for the more efficient application of biodesulfurization for successful sulfur removal, as well as for possible industrial realization and more rational utilization of biotreated coal.
- For the first time, reductive pyrolysis was applied to characterize the organic forms of sulfur and OM of humic acids in Leonardite from a deposit in Turkey and in Bulgarian lignites. The obtained data allow to evaluate the potential of the studied materials for soil remediation as a substitute for chemical fertilizers with natural products. The data from the reductive pyrolysis and the developed methodology provide an opportunity to clarify the paleo-environment for coal formation.
- It has been demonstrated that the AP-TPR / AP-TPO technique in combination with different detection systems (MS, TD-GC / MS) is an analytical approach with great opportunities for qualitative and quantitative study of the OM of coal and other materials.
- Chemical and instrumental methods have been applied to characterize in detail the products from leaching of Bulgarian lignite coal, located in close proximity to an endemic zone in Bulgaria. Their potential as organic groundwater pollutants has been assessed. These studies relate to a new scientific field - "medical geology".

2. Utilization by pyrolysis and activation of industrial and domestic waste to obtain "value-added products". Characterization and application of coal;

The main focus of research in this area is to study the possibilities of thermochemical treatment, and in particular the "slow" pyrolysis, as an environmentally and economically feasible method for sustainable recovery and recycling of various biomass waste and waste materials from biodiesel production, polystyrene and waste car tires. The scientific contributions and achievements of D-r. Gonsalvesh-Musakova in this area can be summarized as follows:

- Slow pyrolysis has been shown to be an effective approach for the utilization of a variety of wastes by converting them into high value-added products that could be used as adsorbents, such as technical and activated carbons. For this purpose, various wastes (both technological and household) were used, such as waste car tires, polystyrene waste, pig manure, tobacco, walnut shells, etc.
- Detailed data were obtained on the influence of the properties of the precursors, the content of mineral mass, the conditions of carbonization and activation on the yield and the characteristics of the products. New approaches have been developed and applied to improve their porous structure and their properties as adsorbents.
- Biochar and activated carbon obtained in the conditions of pyrolysis and subsequent activation have been studied in detail in view of their potential application for soil bioremediation and as adsorbents for water treatment of heavy metals and other pollutants. The capacity of the obtained adsorbents for adsorption of various heavy metal ions was studied, and the mechanisms of adsorption of Cr (VI) and Ni (II) ions with the studied activated carbons were clarified in detail.

3. Analysis of the quality of the atmospheric air. Atmospheric pollutants - fine dust particles, polycyclic aromatic hydrocarbons.

This is a relatively new direction in the scientific activity of D-r. Gonsalvesh-Musakova, however it has very high significance and relevance, both nationally and internationally. Although D-r. Gonsalvesh-Musakova has been working in this scientific field since recently, she has already obtained significant results that convincingly show the opportunities for future development in this promising direction.

- A methodology for qualitative and quantitative analysis of 19 polycyclic aromatic hydrocarbons (PAH) in trace amounts in the composition of fine dust particles in atmospheric air has been developed and validated. For this purpose on the territory of the University "Prof. Assen Zlatarov", Burgas, a point for sampling and monitoring of atmospheric aerosol was built. The obtained data are extremely important, since for the first time in the Municipality of Burgas more than one polycyclic aromatic hydrocarbons compounds in atmospheric air have been studied and their concentrations in the fine dust particles have been determined.
- The data show strong correlation between the concentrations of PM2,5 and PM10 and the associated PAH on the one hand and with some meteorological conditions on the other. The obtained results have significant scientific value and at the same time could serve as a basis for developing management strategies and solutions to reduce emissions of pollutants that

contribute to the accumulation of PM. Thus, the results on this topic would contribute to the actual introduction and compliance with European standards for air quality in Bulgaria.

In summary, it could be concluded that the scientific contributions of D-r. Gonsalvesh-Musakova are interdisciplinary in nature, combining fundamental and applied research, and include the application and development of analytical, chemical and instrumental methods with the aim to acquire new knowledge for solving problems of ecological significance.

Assessment of the Applicant's personal contribution

D-r. Gonsalvesh-Musakova is the first author or author for correspondence in 8 publications from the 18 publications presented for the competition, which convincingly demonstrates her leading role in the research. D-r. Gonsalvesh-Musakova's personal contribution is also related to the application of a wide range of instrumental and analytical methods for analysis and their adaptation to the needs of the research, including improving the experimental settings and further development of new analytical methods. In particular, the achievements related to the improvement of the experimental set-up and improvements in the techniques of Atmospheric Pressure Temperature Programmed Reduction (AP–TPR) and Atmospheric Pressure Temperature Programmed Oxidation (AP– TPO) connected to different detection techniques (e.g. AP-TPR "offline" associated with a thermal desorption system - gas chromatography / mass spectrometry (AP-TPR-TD-GC / MS) could be mentioned here.

It is noteworthy that the scientific activity of Dr. Gonsalvesh-Musakova is realized within the framework of national and international cooperation and research teams, which demonstrates her networking skills for establishing fruitful scientific collaborations.

Participation in projects and scientific forums

The research activity of D-r. Gonsalvesh-Musakova is realized through her active participation in research projects. Information is presented for participation of D-r. Gonsalvesh-Musakova in 21 research projects, of which 9 international (1 funded by the International Atomic Energy Agency; 1 - from the 7th FP of the EU, 1 under the ERASMUS+ program, 6 funded within the program for bilateral inter-academic cooperation of BAS), and 12 projects with different national funding sources (7 - from NSF, 4 - inter-institutional, 1 - under OP SESG). It makes a very good impression that in two of the projects D-r. Gonsalvesh-Musakova is the team leader from the University "Prof. D-r. Assen Zlatarov ", Burgas, which contributes to the establishment of new collaborations, as well as to the introduction and development of new research areas at the University.

The results of D-r. Gonsalvesh-Musakova's research have been presented at a significant number of international and national scientific forums, through scientific reports and poster presentations.

Evaluation of teaching activities

D-r. Gonsalvesh-Musakova presents an impressive report on her teaching activities at the University, which shows her active participation in all elements of the teaching process, including: (i) lecture courses, seminars and laboratory exercises in 7 disciplines in 11 specialties within various bachelor, master and doctoral programs (full-time and part-time); (ii) participation in the renewal of curricula and study programs, as well as in the development of

new curricula in the disciplines "Phytochemistry" and "Organic Analysis" in two bachelor degree programs; (iii) supervision of diploma students and interims - one diploma student and one interim student. Given that before her appointment at the University "Prof. D-r. Assen Zlatarov ", Burgas, D-r. Gonsalvesh-Musakova had no teaching experience, the demonstrated remarkable teaching activity shows the great dedication, enthusiasm and strong motivation of the Candidate to actively participate in the academic and education programs at the University. These qualities present D-r. Gonsalvesh-Musakova as very promising and talented young teacher who has great potential to contribute to increasing students' interest in the relevant disciplines.

Administrative and expert activities

D-r. Gonsalvesh-Musakova is successfully involved in a number of administrative activities at the University "Prof. D-r. Assen Zlatarov ", Burgas. She is a member of the General Assembly of the Faculty of Natural Sciences, a member of the Commission for maintaining the quality of education at the same Faculty, Technical Secretary of the Faculty Council of the Faculty of Natural Sciences and the Scientific Colloquium in Natural and Technical Sciences at the same Faculty. D-r. Gonsalvesh-Musakova's expert work is mainly related to reviewing publications for various international journals.

Personal impressions

I have known D-r. Gonsalvesh-Musakova since she was a student at Sofia University and I had the pleasure to be a supervisor of her master thesis, which gave me the opportunity to observe her work closely and get to know her personal qualities. I was very pleased to witness her successful academic development into an independent, extremely responsible, serious, highly qualified, skillful and competent researcher who seeks for and is able to successfully deal with new challenges, and to solve problems independently. I have always been impressed by her creativity, her passion for new knowledge, the inspiration and strong motivation she puts into her work, as well as her perseverance that help her to overcome difficulties, to find the right approaches and solutions and to brings the research to a successful end. Lenia is an open-minded and easy for communication person, and these personal qualities in combination with the high criteria and requirements she sets for her own work contribute to the establishment of useful collaborations for joint scientific and applied research projects. I do hope that the high scientific potential and qualities of D-r. Gonsalvesh-Musakova will be considered accordingly and she will find the place she deserves in the research and academic staff of the University "Prof. D-r. Assen Zlatarov ", Burgas.

3. Remarks and recommendations

I have no critical remarks on the work of Senior Assistant D-r. Gonsalvesh-Musakova and to the materials submitted for participation in the competition. The documents are precisely organized and presented, the report on the contributions is written clearly and interestingly. I wish D-r. Gonsalvesh-Musakova success in her future work and I am convinced that with her knowledge, skills, experience and ability to work, as well as with her calm and non-conflicting personality, she will become a valuable and respected researcher and lecturer at the University " Prof. D-r. Assen Zlatarov ", Burgas.

CONCLUSION

The scientific activity, the research and teaching metric indicators of Senior Assistant D-r. Lenia-Nezaet de Brito Gonsalvesh-Musakova, reflected in the materials submitted for participation in the competition, cover and exceed the requirements for the academic position of "Associate professor", according to the Law for the Development of the Academic Staff in the Republic of Bulgaria, The Regulations for implementation of the Law and the Regulations for acquiring scientific degrees and academic positions at the University "Prof. D-r. Assen Zlatarov ", Burgas

The scientific achievements of Senior Assistant Dr. Lenia-Nezaet de Brito Gonsalvesh-Musakova convincingly present her as a talented, creative and promising researcher, with her own scientific profile and in-depth approach in important scientific fields. The demonstrated remarkable teaching activity indicates that D-r. Gonsalvesh-Musakova is an enthusiastic, dedicated and motivated teacher who has great potential for future development.

After the analysis of the research output of D-r. Lenia-Nezaet de Brito Gonsalvesh-Musakova, its importance and the scientific contributions reflected therein, **I give my positive assessment** and recommend to the Scientific Jury to prepare a report-proposal for the selection of Senior Assistant Professor D-r. Lenia-Nezaet de Brito Gonsalvesh-Musakova for the academic position of "Associate Professor" at the University "Prof. D-r. Assen Zlatarov ", Burgas in the field of higher education 4.Natural sciences, mathematics and informatics, professional field 4.2. Chemical sciences, scientific specialty "Analytical chemistry (Instrumental analysis methods)".

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Reviewer:

Prof. D-r Pavletta Shestakova