OPINION

by Assoc. Daniela Simeonova Toneva, PhD

Technical University – Varna,

department "Ecology and Environmental Protection"

of a dissertation for awarding the degree of Doctor in the **field of higher education**: 4. Natural sciences, mathematics and informatics, **professional field**: 4.2. Chemical Sciences, **PhD program**: "Ecology and Environmental Protection", scientific organization: University "Prof. Dr. Asen Zlatarov" Burgas, Department: "Ecology and Environmental Protection"

author: Eng. Stela Ivanova Naydenova

Dissertation topic: Investigation of the content of polycyclic aromatic hydrocarbons in atmospheric aerosol

Supervisors: Assoc. Prof. Dr. Lenia Gonsalves and Assoc. Dr. Alexander Dimitrov

This opinion has been prepared on the basis of Order No. UA-484/28.11.2024. of the Rector of the University "Prof. Dr. Asen Zlatarov" – Burgas for the appointment of a Scientific Jury and Order No. UD-503/16.12.2024, according to which I have been assigned to prepare an opinion.

General presentation of the procedure and the PhD student

Under this procedure, I have been provided with a full set of materials on electronic media in accordance with the "Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions at the University "Prof. Dr. Asen Zlatarov" – Burgas" (PURPNSAD).

The candidate, eng. Stela Ivanova Naydenova, is a chemical engineer Master of Industrial Ecology from the University "Prof. Dr. Asen Zlatarov" since 1997. Since 1998. she is a lecturer at the University "Prof. Dr. Asen Zlatarov" Burgas in the Department of Ecology and Environmental Protection. He is the author of 10 scientific publications, reflected in the Register of Academic Positions and Dissertations (at NACID).

The presented set of documents is in accordance with the requirements of the Law on the Acquisition of Scientific Degrees and Occupation of Academic Positions at the University "Prof. Dr. Asen Zlatarov" - Burgas".

Relevance of the problem developed in the dissertation

The topic of the dissertation research is distinguished by a high degree of relevance. Air pollution and deteriorating air quality are among the most significant environmental problems of our time. The relevance and significance of the problem are complemented by the focus of the study, which is placed on the study of the concentrations and time variations of PM2.5 and associated biologically and ecologically important pollutants, including polycyclic aromatic hydrocarbons (PAHs).

Knowledge of the problem

From the presented materials it is clear that a very thorough overview and analytical review of the problem has been carried out by Stela Naydenova, as well as that the candidate is very familiar with the state of the problems and can creatively interpret the literary material.

Methodology of the study

The experimental work and the implementation of the tasks, as well as the main goal in its entirety, require the use of a variety of qualitative and quantitative methods, as well as precise analytical work. The chosen methodology for conducting the scientific research allows to achieve the research goal of

the dissertation in all required aspects, determined by the precisely set tasks. The combination of analytical and systematic approach in the implementation of the research is a positive side of the dissertation.

The chosen research methodology is applicable, well-reasoned and appropriate, applied in the necessary entirety.

Characteristics of Work and Contributions

The purpose and objectives of the dissertation research are precisely defined in the necessary detail. The tasks set have been completed. Preparation, organization and sampling of atmospheric aerosol (PM2.5) for different seasons and weather conditions in the city of Varna has been carried out. Burgas, in the period 2020 - 2023, and the mass concentration of PM2.5 in the collected samples was determined. Qualitative and quantitative determination of surfactants in samples with PM2.5 was carried out when gas chromatography and mass spectral detection were applied. The results obtained were evaluated from the point of view of the PM2.5-associated surfactants, and the model of distribution of surfactants in the studied samples was established. Data are given on the relationship between the levels of pollution with fine particulate matter 2.5 and the concentration of surfactants. Attention is paid to the health risk created by the presence of these pollutants (Excess Cancer Rrisk). The results are creatively analyzed.

The purpose of the dissertation "Study of the concentrations and time variations of PM2.5 and associated biologically and ecologically significant pollutants, including polycyclic aromatic hydrocarbons (PAHs) for the city of Sofia. Burgas", I consider it fulfilled.

The abstract contains five **contributions**, which I accept as significant for theory and practice contributions of **scientific and scientific-applied value,** namely:

1. Scientific contributions:

- The first detailed study of the concentrations of surfactants in different fractions of particulate matter for the Municipality of Burgas. The study provides a unique analysis of the concentrations and distribution of 17 surfactant compounds in atmospheric aerosols, including both PM2.5 and the coarser fractions of PM10. This is the first study of its kind, which covers different districts of Burgas and provides important data on the spatial and seasonal distribution of surfactants, which has not been studied so far in the region.
- Disclosure of the relationship between surfactants, weather factors and other atmospheric pollutants. The study investigated and analyzed the correlation between the concentrations of the studied PM associated surfactants, key weather parameters and other atmospheric pollutants, and provides new data on the complex interactions in the atmosphere. These results contribute to the understanding of the mechanism of distribution, transformation and retention of surfactants in different weather conditions and environments.
- Assessment of health risks associated with exposure to surfactants. The study evaluates the impact of surfactants on human health by applying a quantitative assessment of health risk. The results suggest that surfactant levels, especially during the winter months, can pose a significant health risk, although the calculated additional cancer risk (ECR) is not considered a high priority.

2. **Scientific-applied contributions:**

- Improving air quality management and regulatory policies. The results of the study provide a valuable basis for the development of regulatory policies aimed at limiting pollution in urban areas with high concentrations of atmospheric surfactants and improving the quality of the environment and the associated population status.
- The implemented methodology, including modern sampling and analysis techniques, is also applicable to other studies and programs for environmental monitoring. It can be used to assess air pollution levels in different regions and conditions, to identify likely sources of emissions,

their impact on air quality according to the specifics of the region, as well as to assess their health impacts.

Evaluation of the publications on the dissertation

The abstract contains 4 publications on the topic of the dissertation, which reflect the results of the candidate's research work. For the fulfillment of the minimum national requirements for the acquisition of the Doctoral degree in PN 4.2. Chemical Sciences, the candidate submits 3 publications, all of which are published in refereed and indexed in world-renowned databases with scientific information in the period 2020-2024, 2 of which fall into quartile Q3. All presented publications are the work of a team of authors, in which Eng. Stela Naydenova is a leading author. I have no citation data for the presented publications. Ing. Naydenova has presented a list of 3 participations in scientific conferences and 4 projects related to the dissertation.

With the presented developments, the minimum national requirements for acquiring the degree of Doctor in the professional field 4.2. Chemical sciences are completed by the PhD student. The requirements arising from the Regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions at the University "Prof. Dr. Asen Zlatarov" – Burgas.

Assessment of the abstract

The abstract is developed qualitatively in a volume of 51 pages. and reflects the main results, conclusions and contributions from the dissertation research, as well as the author's publications on the topic of the dissertation. In terms of structure and content, it corresponds to the requirements of the regulations of the University "Prof. Dr. Asen Zlatarov" - Burgas.

Critical Notes on the Dissertation

The presented dissertation demonstrates the necessary depth of research. The high degree of awareness and competence of the PhD student is visible. In essence, I do not have critical notes on the dissertation. I recommend the candidate to focus on the preparation of a monographic work.

Conclusion

The dissertation contains results of scientific and scientific-practical significance, representing an original contribution to science and meets all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations on the Terms and Conditions for Acquiring Scientific Degrees and Occupying Academic Positions at the University "Prof. Dr. Asen Zlatarov" – Burgas. The presented materials and dissertation results fully comply with the specific requirements of the University "Prof. Dr. Asen Zlatarov" – Burgas.

The dissertation shows that the PhD student, Eng. Stela Naydenova, has in-depth theoretical knowledge and professional skills in the field of the doctoral program (Ecology and Environmental Protection), demonstrating qualities, skills and competence for independent scientific research.

Based on the above, I give **a positive complex assessment** and propose to the scientific jury to award the educational and scientific degree of "Doctor" to Stela Ivanova Naydenova in the doctoral program "Ecology and Environmental Protection", in the professional field 4.2. Chemical Sciences.

Подпис заличен
чл.2 от ЗЗЛД

Member of the Scientific Jury:

06.02.2025

Assoc. prof. D. Toneva, PhD