Appendix 12a

REVIEW

of dissertation for the acquisition of:

educational and scientific degree " **doctor** "	x
scientific degree **"Doctor of Science"**	
	the true is indicated by the sign "X"

Author of the dissertation:

		Nikoleta	Dragomirova	Filipova	UCTM
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Preparation of antibacterial photoactive polymer coatings

Scientific area:

4	Natural sciences, mathematics and informatics
code	name

Professional area:

4.2.	Chemical Sciences
code	name

Scientific specialty:

Chemistry of high molecular compounds

The review was written by:

Prof.	DSc	Nikolay	Todorov	Dishovsky	UCTM
academic position	scientific degree	name	middle name	last name	workplace

1. Completion of the provided documents:

A) The dissertation and the competition documents are in full compliance with the Regulations.	4 points	**X**
B) The documents are complete but do not fully comply with the requirements of the Regulations.	2 points	
C) The documents are not completed in accordance with the requirements of the Regulations.	0 points	

		one of the answers given is marked with the sign "X"

Missing documents and violated standards must be described if response C is marked.

2. Meeting the minimum requirements under the Regulations:

A) The candidate meets the minimum requirements	20 points	X
B) The candidate doesn't meet the minimum requirements	0 points	
		one of the answers given is marked with the sign "X"

It must be filled in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed.
The dissertation work has 5 accepted and already published publications, all in indexed journals with an impact factor or impact-rank, of which 2 in the Journal of Chemical Technology and Metallurgy, as well as one each in the Journal of Applied Polymer Science, Bulgarian Chemical Communication and Journal of Polymer Research. On the subject of the dissertation, reports have been presented at 8 conferences, of which 6 in Bulgaria and 2 abroad. In 3 of the publications and in all the reports, the doctoral student is the first author, which is a recognition of her active participation in them. It is obvious that in terms of publication activity, the doctoral student far exceeds the normative requirements for admission to defense.

3. The relevance of the topic of the dissertation:

A) The topic is relevant and new (there are no known results on the topic by other authors)	8 points	X
B) The topic is relevant and results from other authors are known	6 points	
C) The topic is not relevant, but results from other authors are known	2 points	
D) The topic is not relevant and no results from other authors are known	1 point	
E) The topic does not correspond to the level of dissertation	0 points	
		one of the answers given is marked with the sign "X"

The evaluation of the relevance of the dissertation must be substantiated
In the last decade, coatings based on nanogels of natural and synthetic polymers have attracted the attention of scientists due to the possibility of easier modification of surfaces with their help and the inclusion of various antibacterial compounds in the structure of the coatings. The possibility of using nanogels as suitable coatings for different types of surfaces and their full utilization by including photoactive compounds of different nature is a new, interesting and up-to-date approach for obtaining effective antibacterial coatings. This is evidenced by the contributions of the dissertation work, some of which are not available in the literature, such as: -For the first time, photoactive polymer coatings were obtained on a stainless steel substrate based on polymer nanogel and amino modified photosensitizer based on 9-aminoacridine -For the first time, photoactive polymer coatings based on polymer nanogel ("in" type) with included silver nanoparticles (Pox(mDOPA)-Ag0/PAH) and photosensitizer - amino modified protoporphyrin IX, as well as those using a complex of amino modified protoporphyrin were obtained IX with incorporated silver nanoparticles as the final layer. Photoactive coatings were obtained using the LbL dip coating technique on a stainless steel substrate.

4. Knowledge of the problems, subject of research in the dissertation:

A) The doctoral student knows in detail the achievements of other authors on the topic of the dissertation	8 points	X
B) The doctoral student is partially familiar with the achieved results on the topic of the dissertation	4 points	
C) The doctoral student has no prior knowledge of the status of the problems in the dissertation	0 points	
		one of the answers given is marked with the sign "X"

The evaluation must be substantiated if answer C is marked.

5. Type of research:

A) Theoretical	4 points	
B) Applied	4 points	
C) Theoretical with application elements	4 points	X
D) It does not correspond to the level of dissertation	0 points	

		one of the answers given is marked with the sign "X"

The level of research must be substantiated if answer D is marked.

6. Objectives of the research:

A) Realistic and of scientific and / or applied interest	8 points	X
B) Realistic, but not of scientific and / or applied interest	3 points	
C) Unattainable (unrealistic)	0 points	
		one of the answers given is marked with the sign "X"

Objectives must be specified. The type of the set objectives must be justified.
The aim of the current dissertation work is to obtain new photoactive polymer coatings that have good adhesion ability with pronounced antibacterial properties. Based on the set goal, the following tasks for implementation have been formulated: - Design, synthesis and characterization of suitable polymer coatings that have good adhesion to different types of surfaces and at the same time possess appropriate functionality in view of the subsequent post-modification with compounds having strong antimicrobial activity - Design and synthesis of appropriate photosensitizers acting on the principle of photodynamic processes that possess antibacterial activity. - Modification of the obtained polymer coatings with different classes of photosensitizers and tracking of the physicomechanical properties of the obtained materials to stainless steel surfaces, depending on the method of formation of the corresponding coating - Design and synthesis of metal nanoparticles having pronounced antibacterial activity included in the polymer nanogel ("in" type) followed by modification with appropriate photosensitizers or forming a complex with the modified photosensitizers. Tracking the chemical and physicomechanical properties of the obtained materials. Monitoring of their antibacterial activity against different Gram-negative and Gram-positive bacteria, depending on the method of obtaining the respective coating and the type of photosensitizer used. The set goal and the tasks related to its achievement are of scientific and applied interest.

7.Methods of research:

A) Adequate to research and set objectives	8 points	X
B) Partially appropriate, enabling part of the scientific objectives and / or applications to be achieved	4 points	
C) Inappropriate methods	0 points	
		one of the answers given is marked with the sign "X"

Methods must be specified. The type of methods used is justified.
The obtained experimental results were interpreted in depth, and the coatings were characterized by state-of-the-art methods: ATR-FTIR, nuclear magnetic resonance /proton and carbon/, dynamic light scattering, fluorescence analysis, UV-VIS spectroscopy, transmission electron microscopy, atomic- force microscopy, energy-dispersive X-ray analysis with scanning electron microscopy, etc.

8. Contributions of the dissertation:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	
B) They are of significant scientific and / or applied interest, complete and / or summarize previous research	16 points	X
C) They are of scientific and / or applied interest	12 points	
D) Lack of significant contributions	8 points	
E) Lack of contributions	0 points	
		one of the answers given is marked with the sign "X"

Contributions must be specified. The type of results achieved must be justified.
1. For the first time, photoactive polymer coatings were obtained on a stainless steel substrate based on polymer nanogel and amino modified photosensitizer based on 9-aminoacridine. 2. For the first time, photoactive polymer coatings based on polymer nanogel ("in" type) with included silver nanoparticles (Pox(mDOPA)-Ag0/PAH) and photosensitizer - amino modified protoporphyrin IX, as well as those using a complex of amino modified protoporphyrin were obtained IX with incorporated silver nanoparticles as the final layer.

Photoactive coatings were obtained using the LbL dip coating technique on a stainless steel substrate. 3. The results of the conducted antibacterial activity studies demonstrate that the obtained coatings can be used as a platform for obtaining antibacterial polymer coatings for various applications in the field of medicine. The obtained results are of significant scientific and applied interest.

9. Evaluation of the compliance of the dissertation summary with the dissertation:

A) Full compliance	4 points	X
B) Compliance of the main parts	2 points	
C) Lack of compliance of the main parts	0 points	
		one of the answers given is marked with the sign "X"

The evaluation must be substantiated if answer C is marked.

10. Participation of the doctoral student in the achievement of the results of the dissertation:

A) The doctoral student has at least an equal participation	8 points	X
B) The doctoral student has secondary participation	5 points	
C) The participation of the doctoral student is unnoticeable	0 points	
		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the items B or C is marked.

11. Critical notes:

A) Lack of critical notes	8 points	
B) Critical notes of a technical nature	7 points	X
C) Critical notes that would partially improve the results achieved	4 points	
D) Significant critical notes	0 points	

		one of the answers given is marked with the sign "X"

Critical notes must be provided if one of the answers C or D is marked.

12. Conclusion

A) The evaluation of the dissertation is **POSITIVE**	This evaluation is assigned to a total number of at least 65 points	X total point asset of 95 points
B) The evaluation of the dissertation is **NEGATIVE**	This evaluation is assigned to a total number below 65 points	
		one of the answers given is marked with the sign "X"

To be filled in at the request of the reviewer
In my opinion, the dissertation work submitted for review meets, even exceeds, the accepted requirements for obtaining a doctorate in professional field 4.2. "Chemical sciences", scientific specialty "Chemistry of high molecular compounds". My personal impressions of the doctoral student are also excellent. That is why I strongly suggest to the Scientific Jury to award Nicoleta Dragomirova Filipova the requested scientific degree.

	The review was written by:	
03.12.2024	**Prof, D.Sc. Nikolay Dishovsky**	signature