Appendix 12b

REPORT

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:

Assistant	Eng.	Dimitar	Krasimirov	Dimitrov	UCTM
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Functional thin-film coatings involving graphene

Scientific area:

5	Technical science
code	name

Professional area:

5.10	Chemical technologies
code	name

Scientific specialty:

Technology of silicates, binders and refractory non-metallic materials

The report was written by:

Prof.	PhD	Boriana	Rangelova	Tzaneva	Technical university of Sofia
academic position	scientific degree	name	middle name	last name	workplace

1. 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 is mandatory to fill in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed.
Dimitar Dimitrov is a co-author in 4 publications with a total score of 43 out of the required minimum of 30 points, of which one review article on the dissertation problem is in a journal with a quartile Q2, two in a journal with SJR and one in print at the publishing house of the UCTM. In the scientific database SCOPUS, these

publications already have 36 citations from foreign researchers, which shows the relevance of the topic. Therefore, the Eng. Dimitrov exceeds the minimum requirements for the educational and scientific degree "doctor ".

2. 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	
B) The topic is relevant and results from other authors are known	6 points	X
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
Graphene has attracted great scientific interest with its exceptional physical properties, including extremely high thermal conductivity, excellent electrical conductivity, high surface area/volume ratio, remarkable mechanical strength and biocompatibility. This material is also a promising candidate for obtaining polymer nanocomposites with improved mechanical, electrical and thermal properties. However, the use of graphene as a filler has proven to be challenging due to its tendency to agglomerate from van der Waals interactions and its difficulty in dispersing in polymer matrices. In this regard, the research and development of a technology for obtaining polymer composites with the participation of graphene materials as well as thin-film coatings based on them could be considered a very relevant scientific topic, and the achieved results have great prospects for application in various fields.

3. 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.
In the dissertation, several technologies have been developed for obtaining polymer nanocomposites by incorporating graphene oxide (GO), reduced graphene oxide (RGO), graphene nanoplatelets (GPL), zinc oxide and zinc titanate in different ratios, which determines the applied nature of the research. At the same time, the synthesized materials have been thoroughly characterized with modern methods such as SEM, TEM, XRD, etc., which adds theoretical knowledge about them. Tests for the applicability of the layers in the field of optics and as protective and antibacterial coatings, determine the research as theoretical with an element of applications.

4. 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 objectives of the research are clearly defined, realistic, with a strong applied interest and aimed at obtaining and characterizing thin-film coatings with the participation of graphene materials such as graphene oxide, reduced graphene oxide and graphene nanoplatelets. The formulated tasks significantly expand the goal by including other additives such as ZnO and $ZnTiO_3$ nanoparticles, as well as research into anti-reflective coatings without the use of graphene materials.

5. 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.
The scientific contributions of the dissertation could be summarized as follows: - establishing appropriate compositions and proportions of additives from GO, RGO, ZnO and ZnO+RGO mixtures for obtaining nanocomposite coatings based on silicone; - obtaining nanocomposite coatings based on epoxy and different additives and proportions of GPL, Go and $ZnTiO_3$, as a synergistic effect between $ZnTiO_3$ and GPL for stabilizing nanoparticles in the epoxy matrix has been proven. - the antimicrobial properties of all synthesized nanocomposite layers have been determined with respect to pathogens such as *Escherichia coli* and *Staphylococcus aureus*.

6. Conclusion

A) The evaluation of the dissertation is **POSITIVE**	This evaluation is assigned to a total number of at least 40 points	
B) The evaluation of the dissertation is **NEGATIVE**	This evaluation is assigned to a total number below 40 points	
		one of the answers given is marked with the sign "X"

To be filled in at the request of the member of the scientific jury
The dissertation of Eng. Dimitar Dimitrov fully meets the legal requirements. During the work on the dissertation, Eng. Dimitar Dimitrov has carried out a large number of experimental tests to obtain new nanocomposite materials while simultaneously developing the technologies for their preparation and their comprehensive characterization through physical methods of analysis. This shows a responsible attitude and an acquired research approaches to solving scientific problems with practical application. Based on everything described above, I give a "POSITIVE" assessment of the dissertation work and propose to the scientific jury to vote for awarding the scientific and educational degree "doctor" to Eng. Dimitar Krasimirov Dimitrov.

18.08.2025	The report was written by:	
date		signature