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		**Dimitar**	**Krasimirov**	**Dimitrov**	**UCTM-Sofia**
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Functional thin-film coatings with the participation of graphene

Scientific area:

5	**Technical sciences**
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:

Associate professor	**PhD**	**Albena**	**Petrova**	**Yoleva**	**UCTM-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.

The PhD student has 4 publications in reputable journals, one of which has an impact factor of 4.128. He has presented the results of his work at 12 conferences. He has 28 citations to publications on his dissertation.

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
The topic of functional thin-film coatings involving graphene materials with potential for application in optics, such as protective and antibacterial coatings, is very relevant. In recent years, much work has been done on graphene, composites based on it, and coatings involving it. Graphene materials have many promising applications as additives in various coatings with antimicrobial and conductive properties. **Thin-film coatings have a rich history and are an indispensable component of many modern materials. They account for the functioning of practically every modern optical element. The methods of their preparation are inextricably linked to those used in electronics, photonics, laser technology, corrosion protection, etc. Thin-film coatings involving graphene materials are a promising field of work, since many of the properties of such composite materials are unexplored, and the benefits and challenges have yet to be investigated.**

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.

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 aim of the doctoral dissertation is to obtain and characterize functional thin-film coatings with the participation of graphene materials with possibilities for application in optics, as protective and antibacterial coatings. The following tasks have been identified for its implementation. **- To obtain and characterize thin-film optical coatings according to predefined parameters.** **- To study and test various materials for inclusion in thin-film coatings.** **- To obtain and characterize polymer composites with the participation of graphene materials.** **- To test the application of a polymer coating of Poly(Bisphenol A- co -epichlorohydrin) on samples by dip coating method.** **- To study and optimize a scheme for processing the substrates.** **- To obtain RGO by an appropriate method.** **- To obtain nanoparticles for inclusion in composites – ZnO, ZnTiO3.** **- To test different methods of dispersion of graphene materials in polymer composites.** **- To select and apply appropriate methods for characterization of the resulting coatings.**

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.
1. A methodology for obtaining optical coatings with specified optical properties – high transmittance, reflective properties – position, intensity and width of the reflection peak using the Electron Beam Physical Vapor Deposition (EBPVD) method has been proposed. A scheme for processing substrates before applying thin-film optical coatings has been improved. **2. A procedure for replacing Ti_3O_5 with ZrO_2 – in the composition of multilayer optical coatings while maintaining optical properties within the specified range has been proposed and methods for compensating for the emerging differences in the optical behavior of the coatings have been proposed.** **3. Original nanocomposite compositions based on silicone rubber with the participation of RGO and nanosized ZnO in different ratios have been obtained. The antimicrobial properties of all compositions have been studied and the most active of them have been determined - GO_3, Zn1, ZR1, ZR3.** **4. The properties of GO and GPL for association with nanosized $ZnTiO_3$ particles were compared and it was proven that in the presence of GPL the nanoparticles are more stable and resistant to aggregation.** **5. The influence of the viscosity of the polymer matrix on the delamination of the graphene layers and the stability of the suspension was evaluated.**

6. Conclusion

A) The evaluation of the dissertation is **POSITIVE**	This evaluation is assigned to a total number of at least 40 points	**X** **54 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 is distributable, sufficient in volume, meets all the requirements of the Law on the State Academic Research and Development of the Republic of Bulgaria and the Regulations for the Acquisition of Scientific Degrees and Titles at the Technical University of Bulgaria, contains scientific and scientific-applied contributions and I believe that the doctoral student Dimitar Krasimirov Dimitrov is fully ready for the award of the educational and scientific degree "Doctor" in the scientific specialty 5.10. Chemical Technologies (Technology of Silicates, Binders and Refractory Non-Metallic Materials).

15.07.2025	The report was written by:	
date		signature