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:

Assistant Prof.		Georgi	Bozhilov	Georgiev	UCTM - Sofia
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Synthesis and Application of Modified Carbon Materials Derived from Renewable Raw Materials and Industrial Wastes

Scientific area:

5	Technical sciences
code	name

Professional area:

5.10	Chemical technologies
code	name

Scientific specialty:

Technology of the natural and synthetic fuels

The review was written by:

Prof.	PhD	Dobromir	Ivanov	Yordanov	BSU “Prof. Dr. Assen Zlatarov”
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.
The dissertation and the documents for the competition fully comply with Art. 13 of the Regulations for the Acquisition of Scientific Degrees and Holding Academic Positions at the University of Chemical Technology and Metallurgy.

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 doctoral student Georgi Georgiev has presented 6 publications, all of which are referenced and indexed in world-renowned databases of scientific information, which are on the topic of the dissertation. This shows the significance of the research, as the doctoral student has made a significant contribution. 16 citations to the publications included in the dissertation are also presented, which proves the serious impact of the research in the global scientific community. All citations are referenced and indexed in world-renowned databases of scientific information.

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	
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 the dissertation is extremely relevant in modern chemical technologies, due to the need to utilize renewable raw materials and industrial waste as valuable materials for cleaning industrial water streams and obtaining catalysts for chemical reactions. The doctoral student contributed to this topic with the combination of the obtained and investigated carbon materials in their capacity as adsorbents and catalysts.

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.
The literature review of the dissertation comprehensively describes the types of renewable raw materials and industrial waste, the methods for obtaining carbon materials (pyrolysis, physical or chemical activation) and the necessary characteristics for their use as adsorbents and catalysts, and the methods for analyzing the obtained materials are described in detail. The literature sources studied and presented in the dissertation are 141 and provide an up-to-date assessment of scientific research in the world community at the present time.

5. Type of research:

A) Theoretical	4 points	
B) Applied	4 points	X
C) Theoretical with application elements	4 points	
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.
The scientific research is applied, aimed at the utilization of waste industrial materials and renewable ones in carbon adsorbents, which are used in the removal of organic pollutants in wastewater and in the preparation of heterogeneous carbon catalysts for the conversion of glucose into 5-hydroxymethylfurfural.

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 this dissertation is to obtain modified carbon materials from renewable raw materials and industrial waste, to study their structure, surface chemistry and functional properties with a view to their use as adsorbents in wastewater treatment from organic pollutants and as catalysts in chemical processes. The goals set are realistic and have been achieved in the dissertation.

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 research methods are adequate and suitable for achieving the goals of the dissertation work - chemical and physical activation, pyrolysis and hydropyrolysis were used to obtain activated carbons from renewable sources (jojoba, pistachio, algae, almond shells, banana, orange peels and cocoa husks), as well as carbonization of bitumen insulation, polystyrene waste to obtain activated carbon, and I must note the significant contribution of the doctoral student related to the development of a new method for the synthesis of carbon foam from a mixture of coal pitch and furfural, which allows the synthesis of foam without the use of high pressure and stabilization. The analysis of the characteristics of the obtained products and their application is described with elemental analysis, IR spectroscopy, adsorption isotherms, thermogravimetric analysis, scanning electron microscopy and catalytic studies.

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.
The dissertation has the following contributions: An integrated approach has been developed for the utilization of various waste raw materials by converting them into functional carbon materials with controlled structure and properties. A relationship has been established between the origin and composition of the starting raw materials, the processing conditions and the formation of a porous and graphite-like structure, which determines the functional properties of the materials. A simplified and scalable method has been developed for the production of turbostratic carbon from polymer waste in an open, pressureless system, leading to materials with a high degree of structural order and potential for electrochemical and catalytic applications. An energy-efficient method for the synthesis of carbon foam in an open vessel under atmospheric conditions without the use of an inert medium has been developed, which significantly simplifies the process and creates prerequisites for industrial application. Effective carbon adsorbents have been created from various waste sources, and the possibility of their application in the removal of organic pollutants has been proven. Heterogeneous carbon catalysts with combined Brønsted and Lewis acid centers have been developed, in which a synergistic effect has been established in the conversion of glucose to 5-hydroxymethylfurfural. The results achieved are practically applicable and are aimed at the purification of wastewater from dyes (methyl orange and bromothymol blue) and at catalyzing the reaction of converting glucose to 5-hydroxymethylfurfural with the modified catalysts ACZn and AC18M, providing metal and acid active centers necessary for catalytic dehydration.

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.
The Author's summary of dissertation fully presents the main points of the dissertation work - the relevance of the problem, the results achieved, the conclusions based on the results obtained and the discussions and contributions.

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	X
B) Critical notes of a technical nature	7 points	
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.
I have no critical remarks.

12. Conclusion

A) The evaluation of the dissertation is **POSITIVE**	This evaluation is assigned to a total number of at least 65 points	X
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
The topic of the dissertation is extremely relevant in modern chemical technologies, due to the need to utilize renewable raw materials and industrial waste as valuable materials for the purification of industrial water streams and the production of catalysts for chemical reactions. The doctoral student has made his contribution to this topic with the combination of the obtained and studied carbon materials in their capacity as adsorbents and catalysts. The achieved results are practical and applied and are aimed at the purification of wastewater from dyes (methyl orange and bromothymol blue) and at catalyzing the reaction of glucose conversion into 5-hydroxymethylfurfural with the modified catalysts ACZn and AC18M, providing metal and acid active centers necessary for catalytic dehydration. The dissertation is based on 6 publications, all in refereed and indexed in world-renowned databases with scientific information, which are on the topic of the dissertation. This shows the significance of the research, as the doctoral student has made a significant contribution. 16 citations to the publications included in the dissertation are also presented, which proves the serious impact of the research in the global scientific community. All citations are referenced and indexed in world-renowned databases of scientific information.

04.06.2026	The review was written by:	
date		signature