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:

		Asya	Konstantinova	Manoylova	PhD student at UCTM
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Sustainable Soil Management through Carbon Farming

Scientific area:

5	Technical Sciences
code	name

Professional area:

5.13	General Engineering
code	name

Scientific specialty:

Systems and Devices for Environmental Protection

The review was written by:

Professor	Doctor	Martin	Petrov	Tsvetkov	Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski"
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 materials submitted under the procedure for awarding the educational and scientific degree of "Doctor" (PhD) comply with the requirements of the Academic Staff Development Act in the Republic of Bulgaria, the Regulations for its Implementation, and the Regulations for the Acquisition of Academic Degrees and the Occupation of Academic Positions at the University of Chemical Technology and Metallurgy (UCTM)

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 candidate is a co-author of **four scientific publications** related to the dissertation topic, including articles published in the *Journal of Chemical Technology and Metallurgy* and the *Journal of Thermal Analysis and Calorimetry*, as well as two papers published in conference proceedings. The total number of points awarded for these publications is **41.66**, which significantly exceeds the minimum requirement of 30 points stipulated by the Academic Staff Development Act in the Republic of Bulgaria (ASDARB) for this indicator. Furthermore, the candidate is a co-author of an additional publication (as evidenced by a search in the Scopus database) that is not directly related to the dissertation topic, demonstrating the candidate's broader scientific expertise. **One independent citation** of the publication in the *Journal of Chemical Technology and Metallurgy* has been identified, confirming the scientific significance of the results obtained in the dissertation research.

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 is highly relevant in the context of the circular economy, the reduction of industrial waste, and sustainable soil management. The use of biomass ashes, sludges, and zeolites has been investigated in previous studies; however, the present research provides an additional contribution through a systematic comparison of multicomponent mixtures and sequential modifications using acid, potassium-rich ash, and zeolite.

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 comprehensive literature review covers the mechanisms of organic carbon retention, ashes and sludges from the pulp and paper industry, poultry manure, zeolites, acid activation, and the relevant regulatory framework. A total of 195 literature sources have been reviewed, and a specific research gap has been identified concerning the structural evolution of multicomponent organomineral systems. The doctoral candidate's research is specifically aimed at addressing the identified gaps in scientific knowledge.

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 research is predominantly experimental and application-oriented, with an emphasis on the preparation and physicochemical characterization of potential soil amendments. It provides a scientific basis for subsequent soil and agronomic validation, without constituting a direct field assessment of their effectiveness.

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.
Aim: To develop and characterize organomineral mixtures based on industrial and agricultural wastes, with potential applications in sustainable soil management and carbon farming. The research objectives include the selection and analysis of raw materials, experimental design of mixtures, chemical, mineralogical, and morphological characterization, evaluation of the effects of the modifications, and assessment of their potential for soil application. The research aim and objectives are realistic and of significant scientific and practical relevance.

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.
A wide range of physicochemical and analytical techniques has been employed, including ICP-OES for determining the elemental composition and potentially toxic elements; CHNS analysis for carbon, hydrogen, nitrogen, and sulfur content; potentiometric determination of pH; XRD for identifying mineral phases; FT-IR for characterizing functional groups; and SEM/EDS for examining morphology and local elemental composition. The application of these techniques enables the achievement of the objectives set out in the dissertation. Nevertheless, this characterization alone does not provide sufficient evidence of long-term soil carbon sequestration, nutrient bioavailability, or metal immobilization.

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.
Three scientific and three scientific-applied contributions are presented. The scientific contributions include the development of 40 formulations within the C1–C3 series, the establishment of relationships between composition, phase transformations, and morphology, and the elucidation of the roles of acid activation, potassium-rich ash, and zeolite. The practical contributions include the development of a scheme for the resource recovery and utilization of secondary raw materials, a comprehensive analytical assessment, and a conceptual framework for future soil applications.

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 dissertation abstract presents the research aim and objectives, raw materials, three experimental series, analytical methods employed, main results, conclusions, scientific contributions, and publications related to the dissertation. No significant discrepancies in the scientific content have been identified. The abstract is appropriately more concise than the dissertation itself, which is consistent with generally accepted academic standards.

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.
The dissertation includes a declaration of originality signed by the doctoral candidate. According to the list of publications, Asya Manoylova is a co-author of the published research papers and the first author of the publication concerning the potential of sludges for CO_2 capture. Her CV demonstrates relevant laboratory and analytical experience. These facts support the assessment that the doctoral candidate has made at least an equal contribution to the research, leaving no doubt about her active involvement in conducting the experiments and interpreting the results obtained.

11. Critical notes:

A) Lack of critical notes	8 points	
B) Critical notes of a technical nature	7 points	
C) Critical notes that would partially improve the results achieved	4 points	X
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 several comments on the dissertation, which should be regarded as recommendations for further research and development: 1. Soil, vegetation, and long-term incubation studies have not been conducted to demonstrate the agronomic effectiveness of the proposed materials and their actual carbon sequestration potential.

2. Leaching tests and assessments of the mobility and bioavailability of potentially toxic elements are needed, particularly for certain formulations within the C2 series. Furthermore, analytical data on mercury (Hg) are lacking. 3. The inclusion of quantitative indicators of carbon stability would provide additional valuable information. These limitations have been acknowledged or addressed in the dissertation itself. They do not detract from the significance of the results obtained by the doctoral candidate, nor do they in any way diminish the value of the research conducted and the substantial work accomplished.

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
Overall Score: 90/100 points The dissertation of Asya Konstantinova Manoylova addresses a topical and significant scientific and technological problem. I consider that the stated research aim and objectives have been successfully achieved and that the formulated scientific and applied scientific contributions are consistent with the results presented. **In view of all the above, I strongly recommend that the esteemed members of the Scientific Jury award Asya Konstantinova Manoylova the educational and scientific degree of "Doctor" (PhD) in Professional Field 5.13. General Engineering (Systems and Devices for Environmental Protection).**

14.11.2026	The review was written by:	
date		signature