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:

		Eduard	Lyudmilov	Stefanov	UCTM
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Speciation Speciation analysis of arsenic in copper electrolyte, waters and soils

Scientific area:

4	Natural Sciences, Mathematics and Informatics
code	name

Professional area:

4.2	Chemical Sciences
code	name

Scientific specialty:

Analytical Chemistry

The report was written by:

Assoc. Prof.	Dr	Daniela	Simeonova	Tsekova	UCTM
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"

Results included in the PhD Thesis are summarized in four scientific publications with a total of 34 points. The PhD student is the first author in three of these four papers. Two papers are published

in "Archives of Metallurgy and Materials" (IF = 0.6 and Q4). One is in a journal without impact factor, but indexed in Scopus "Journal of Chemical Technology & Metallurgy"(Q3,SJR =10 points). The fourth paper is published in the journal "Science, Engineering, Education", without both impact factor and SJR. One citation has been noted of one of the articles published in 2022. Part of the results are presented at three scientific forums.

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 the PhD thesis presents extremely significant area of ecology and analytical chemistry, as it is dedicated to the development of suitable, cheap and accessible analytical methods for the determination of the forms of arsenic in contaminated wastewater, contaminated soils and contaminated samples of copper electrolyte from cathode copper production. Speciation analysis of arsenic finds also wide application in the environmental monitoring, food control and human health.

3. 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 objectives and experiments performed are devoted to the development of methods for the determination of the two inorganic forms of arsenic As (III) and As (V) in target samples, applying extraction and appropriate detection. A new facile and "green" method has also been developed for the same purpose in copper electrolyte. All this emphasizes that the level of research in this study is of a applied nature.

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 main objective of the PhD Thesis is the development of suitable, cheap and accessible methods for the determination of arsenic in contaminated samples such as: copper electrolyte from cathode copper production, contaminated wastewater and arsenic-contaminated soils. To fulfil the goal, several methods of speciation analysis aiming determination of both inorganic forms of arsenic in various samples have been developed. They are based on various analytical approaches - extraction, chromatography and appropriate detection (ICP-OES, ICP-MS). Two of these methods have already found application in Aurubis. It was shown that the methods developed have good accuracy, precision and selectivity towards inorganic forms of arsenic.

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 contributions of this PhD Thesis are of significant scientific and applied interest. In general, they concern both scientific development of methods and their real application. Four methods of speciation analysis of arsenic in samples with different matrix composition were developed. Two of the developed methods have been implemented in the laboratory practice of "Aurubis Bulgaria": 1) ICP-OES method in combination with liquid-liquid extraction for simultaneous determination of inorganic forms of arsenic in copper electrolyte. 2) ICP-MS method with liquid-liquid extraction to determine the forms of arsenic in wastewater. An innovative approach for arsenic wastewater treatment was tested - precipitation of arsenic as crystalline scorodite FeAsO4.2H2O. On this basis, "Aurubis Bulgaria" designed sewage treatment plant for industrial wastewater.

6. Conclusion

A) The evaluation of the dissertation is **POSITIVE**	This evaluation is assigned to a total number of at least 40 points	X
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 PhD Thesis presented to me fully complies with the requirements for awarding the educational and scientific degree “Doctor” according to both the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations on the terms and conditions for acquiring scientific

degrees and holding academic positions at UCTM, Sofia. On this ground, I recommend to the respected members of the Academic Board to award тhe Academic Degree „Doctor/“ on Eduard Lyudmilov Stefanov in the Scientific field 4.2. Chemical Sciences, Specialty: Analytical Chemistry.

03.06.2024	The report was written by:	
date		signature