

**REPORT**

of dissertation for the acquisition of:

educational and scientific degree " <b>doctor</b> "	X
scientific degree " <b>Doctor of Science</b> "	
	the true is indicated by the sign "X"

**Author of the dissertation:**

		Artjom	Vadimovich	Bezfamilnij	UCTM
academic position	scientific degree	name	middle name	last name	workplace

**Topic of the dissertation:**

"Study of complexation equilibria involving metal ions and organic ligands: composition, sensing activity and application"

**Scientific area:**

4.	Natural science, mathematics and informatics
code	name

**Professional area:**

4.2.	"Chemical Sciences"
code	name

**Scientific specialty:**

"Analytical Chemistry"

**The report was written by:**

Assoc. Prof.	PhD.	Angelina	Konstantinova	Popova	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"

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 dissertation is written on 161 pages, contains 68 figures and 24 tables. 246 literary sources are cited.

Three articles have been published on the subject of the dissertation, with a total point asset of 50 points (with a minimum requirement of 30 points), one of which is in a journal with Q1. The doctoral student also took part in nine scientific forums. The impact of the achieved results is illustrated by 6 citations of two of the articles.

It is clear that the applicant exceeds the minimum requirements.

The abstract fully corresponds to the 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	X
B) The topic is relevant and results from other authors are known	6 points	
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 problem of environmental pollution has been a priority topic in research work in recent years. Heavy metals and their compounds are toxic, persistent and tend to accumulate in organisms and ecosystems. The observed pollution with heavy metals leads to an increase in genetic mutations, cancer, cardiovascular diseases, etc. health issues. The new environmental philosophy is to keep the environment untouched by human presence. This requires strict rules and control of the chemicals used and their emissions into the environment, especially into water. This requires serious research work related to the identification of problem areas and the development of analytical methods of analysis.

On the other hand, a large number of metals, such as copper, zinc, iron, nickel, cobalt, manganese, are useful for the functioning of biological systems in living organisms. Metal ions exhibit their biological activity primarily after binding to a ligand. The nature of the metal ion, the type of ligand and the topology of the complex part determine the medicinal value of metal complexes. The modern safe operation of human activity requires the use of highly sensitive sensors for metal and metal-containing forms detecting wet and nano-quantities of these analytes. This would allow compliance with modern monitoring and control requirements.

In this regard, the relevance and significance of the dissertation work is indisputable.

## 3. Type of research:

A) Theoretical	4 points	X
B) Applied	4 points	
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 of a scientific and scientific-applied nature. The obtained results can find specific application in practice.

#### 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 objective of the research is realistically set and represents scientific and scientific-applied interest. It is - to study the complex-forming equilibrium processes with the participation of metal ions and organic ligands containing electron-donor groups for chelate binding and to show the application of the complex-forming properties of the studied ligands for the detection of metals in real samples.

To achieve this, specific tasks have been defined, which are carried out within the framework of the research.

#### 5. Contributions of the dissertation:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	X
B) They are of significant scientific and / or applied interest, complete and / or summarize previous research	16 points	
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.

I accept the attached statement of the applicant's contributions.

They are briefly as follows:

1. 22 complex forms were studied and new data were obtained on the complexation properties between ions and multifunctional organic ligands.

2. The specific application in real samples of two voltammetric methods for the detection and determination of copper(2+) ions using organic ligands aminohydantoin/azo-azomethine derivatives is shown. The developed methods are fast, precise and accurate, and the analysis equipment used is affordable.

The achieved results can be attributed to: proving with new means essential new aspects of already existing scientific fields; creating new methods and obtaining confirmatory facts. The dissertation contains scientific and scientific-applied results that represent an original contribution to science.

#### 6. Conclusion

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

<p>To be filled in at the request of the member of the scientific jury</p> <p>My presented dissertation is a thorough and competent in its interpretations research. It contains scientific and scientific-applied results that represent a significant and original contribution to science. The dissertation meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for the Implementation of the ZRASRB and the relevant Regulations of the HTMU. The presented materials and dissertation results fully correspond to the specific requirements.</p> <p>Due to the above, I confidently give my positive assessment of the conducted research, represented by a dissertation work, abstract, achieved results and contributions, and I propose to the scientific jury to award the scientific degree "Doctor" to Artyom Vadimovich Bezfamilniy in the field of higher education 4. Natural Sciences ; 4.2. Chemical Sciences (Analytical Chemistry).</p>
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	The report was written by:	<b>Assoc. Prof. Angelina Popova</b>
3.04.2023		