

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:

		Martin	Rosenov	Pernikov	
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Synthesis, microstructure and electrical properties of oxide glass ceramics

Scientific area:

4.	Natural Sciences, Mathematics and Informatics
code	name

Professional area:

4.1.	Physical Sciences
code	name

Scientific specialty:

Condensed Matter Electric, Magnetic and Optical Properties
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The report was written by:

Assoc. Prof.	PhD	Vanya	Dimitrova	Lilova	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 dissertation is based on 3 scientific publications: two in Journal of Chemical Technology and Metallurgy (for 2023 Q3 – 15 points) and one in Bulgarian Chemical Communications (for 2022 Q4 – 12 points), which

correspond to 42 points. They exceed the minimum requirements (30 points) of Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for the Acquisition of Scientific Degrees and Occupation of Academic Positions at the UCTM. One citation is also noted.

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 dissertation work is in a topical direction, related to the preparation of new dielectric materials with controllable electrical properties and applications in energy storage.

The literature review carried out by PhD student convinces of the relevance and importance of his planned scientific research. The literature review is competently written and leaves no doubt that the Eng. Martin Pernikov knows the state of the problem well. The processed scientific information has allowed the precise and clear formulation of the dissertation's objectives and the appropriate selection of specific tasks for their successful implementation.

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.

The results of the completed problems in the dissertation are of a fundamental nature and can contribute to the subsequent determination of the areas of practical application of the studied materials in electronics/microelectronics, medicine and sensorics.

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"
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Objectives must be specified. The type of the set objectives must be justified.

The main goal of the dissertation is to study the influence of the chemical and phase composition and the microstructure on the dielectric and magnetic properties of glass ceramics containing barium titanate or modified barium titanate with nano- and submicron crystal sizes. For the implementation of this goal, tasks have been set for obtaining glass ceramics by the method of controlled crystallization of previously obtained oxide glasses from two multicomponent systems. In parallel, a complex characterization of their thermal properties (by dilatometry and differential scanning calorimetry), phase composition (by X-ray diffraction and electron backscatter diffraction), structure (by IR and Raman spectroscopy), microstructure (by optical microscopy, scanning electron microscopy and microcomputed tomography), electrical properties (via impedance spectroscopy), mechanical properties (via controlled microindentation) and magnetic properties (via vibration magnetometer) was carried out.

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 the present dissertation are of a fundamental nature. They refer to the synthesis of new compositions of multicomponent oxide glasses, in which it is possible to obtain a dielectric phase with a high volume fraction and to obtain from them glass ceramics by the method of controlled crystallization. New data were obtained on the physico-chemical, thermo-physical and mechanical properties of the obtained materials. Special attention is paid to the study of electrical properties. The mechanism of electrical conduction in the obtained glasses and glass-ceramics is established and their areas of potential applicability as dielectrics in multilayer capacitors, parts of sensor and opto-electronic systems are outlined.

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 dissertation fully meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Implementation and the Regulations for the Acquisition of

Scientific Degrees and Occupation of Academic Positions at the UCTM.

Therefore, I give a positive assessment of the dissertation submitted to me for a report and I propose to the esteemed members of the scientific jury to award the educational and scientific degree "doctor" in scientific area 4. Natural sciences, Mathematics and Informatics, professional area 4.1. Physical Sciences, scientific specialty Condensed Matter Electric, Magnetic and Optical Properties of Eng. Martin Rosenov Pernikov.

25.06.2024	The report was written by:	
date		signature