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:

		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:

Electrical, magnetic and optical properties of condensed matter

The review was written by:

Professor	**Doctor of Physics**	**Plamen**	**Kostadinov**	**Petkov**	**U C T M**
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.

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.

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 relevance of the dissertation is undeniable. In essence, the entire research is aimed at gathering new scientific data regarding the controlled crystallization of barium and strontium-barium titanate from complex oxide systems. The elucidation of the structure and then the influence on the dielectric and magnetic properties is also a good basis for the application of certain compositions as magnetic sensors. For me, this research is definitely related to obtaining new fundamental characteristics for the investigated complex oxide systems.

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.

5. 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.

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 main goal of the dissertation is to clarify the influence of the structure and composition of complex oxide systems on the crystallization of modified barium titanate for use in electronics. Undoubtedly, the aim is to accumulate new scientific data on the $Na_2O/BaO/TiO_2/B_2O^3/SiO_2/Al_2O_3$ system in the presence of iron and strontium oxide. To

achieve this ambitious goal, the following tasks have been correctly formulated and implemented: -Obtaining glasses in the systems $Na_2O/BaO/TiO_2/B_2O_3/SiO_2/Al_2O_3$ and $Na_2O/BaO/TiO_2/B_2O_3/SiO_2/Al_2O_3/Fe_2O_3$, where equimolar concentrations of BaO are replaced by SrO; - Preparation of glass ceramics containing barium titanate or modified barium titanate using the method of controlled crystallization; - Complex characterization of phase composition, structure, microstructure, electrical, mechanical and magnetic properties of the inlay and glass ceramics.

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.
To carry out the research, a number of modern methods of analysis were used, which the dissertation student mastered and reached the level of correct interpretation of the results. For information, I will mention some of them - differential scanning calorimetry, thermal dilatometry, X-ray diffractometry, scanning electron microscopy, computer tomography, vibrational spectroscopy, impedance spectroscopy, vibrational magnetometry, etc. The capabilities of these methods, naturally within their accuracy, are completely sufficient for the characterization of the newly synthesized samples in terms of structure, electrical, mechanical, thermal and magnetic properties.

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.
I agree with the author's claims regarding the contributions of the dissertation. In my opinion, they boil down to the accumulation of new data and facts about complex oxide systems containing barium, strontium and titanium oxide, as a starting point for obtaining barium-strontium titanate in an oxide matrix. I would formulate the main contributions as follows: - New compositions of oxide glasses with a high content of alkali and alkaline earth oxides were studied, in which a dielectric phase with a high volume fraction was obtained; - The main physico-chemical properties of the obtained glasses are clarified - temperatures of glass formation and crystallization, basic structural units in glasses and glass ceramics, phase composition and morphology of the obtained glass ceramics; - A hypothesis is proposed for the influence of phase separation on the process of controlled crystallization; - For the first time, data were obtained on the thermophysical and mechanical properties of the obtained glasses and their interrelationship was established; -The mechanism of electrical conductivity is established and their areas of applicability as dielectrics in multilayer capacitors, parts of sensor and opto-electronic devices are outlined.

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.

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	
B) Critical notes of a technical nature	7 points	**X**
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 on the essence of the experiment and the conclusions from them. Of course, there are some stylistic inaccuracies and technical omissions, which, however, do not change the overall very good impression of the dissertation.

12. Conclusion

A) The evaluation of the dissertation is **POSITIVE**	This evaluation is assigned to a total number of at least 65 points	**93 Pts 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
I can confidently state that the dissertation submitted for review fully meets the requirements of the Regulations for obtaining scientific degrees and holding academic positions at UCTM in terms of volume, scientific content, contributions and number of publications. On this basis and in view of the scientific contributions of the dissertation work, the significance of the obtained results, and the possibility of applicability of the obtained materials in the practice, I recommend with conviction to the members of the Scientific Jury to vote positively for awarding the PhD in the scientific specialty 4.1 "Physical Sciences" ("Electrical, magnetic and optical properties of condensed matter") of **Eng. Martin Rosenov Penikov**.

25.0624.	The review was written by:	
date		signature