

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:

		Hristofor	Ivanov	Skandaliev	
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

DEVELOPMENT AND CHARACTERIZATION OF ECOLOGICAL AND NON-TOXIC SOLID ROCKET PROPELLANTS

Scientific area:

5	Technical sciences
code	name

Professional area:

5.10	Chemical Technologies
code	name

Scientific specialty:

Technology of Natural and Synthetic Fuels

The report was written by:

Professor	Doctor	Emil	Georgiev	Mihailov	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.

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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 relevance of the dissertation work is also determined by the need to develop rocket fuels using simplified, safe processing technologies, thereby reducing production risks, increasing reliability, and facilitating their practical implementation. The results obtained could be applied both to the modernisation of existing rocket systems and to the development of new products for specific purposes.

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.

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 goal of this dissertation is the development, research, and characterisation of solid rocket fuels (SRFs), with increased safety in their production, storage, and operation, and reduced environmental impact. The goals set and the methods for their achievement are related to experimental and theoretical scientific research, with the aim of better understanding the fundamental aspects, mastering and applying the developed rocket fuels as an alternative to existing solid rocket fuels, as well as a basis for creating new functional systems and products intended for specific areas of application.

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	
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 achieved results with scientific, applied science and applied engineering contributions can be summarised as follows:		
Scientific:		
<ul style="list-style-type: none"> • A comprehensive algorithm for the investigation and analysis of innovative ecological and non-toxic solid rocket propellants has been formulated, systematizing and adapting established global practices. • Numerical values for specific parameters and constants of a potassium nitrate/isomalt (KNO₃/isomalt) type solid rocket propellant have been determined for the first time. • The thermal behavior of the potassium nitrate/isomalt propellant was characterized, and the values of thermal effects during its thermal decomposition were recorded. • The exceptionally low sensitivity of the potassium nitrate/isomalt propellant to external mechanical stimuli has been demonstrated. • The relationship between operating pressure and burn rate was established through internal ballistic studies, yielding values for the actual specific impulse of the KNO₃/isomalt propellant. • A novel series of solid rocket propellants (SRPs) based on potassium periodate and sodium periodate oxidizers has been developed. Using the formulated algorithm, their physico-mechanical properties were investigated, and specific numerical values were obtained. • The combustion products of the potassium nitrate/isomalt propellant have been determined qualitatively and quantitatively through gas analysis of samples. 		
Applied science:		
<ul style="list-style-type: none"> • The mechanisms of thermal decomposition of the developed periodate-based SRPs have been described. Their sensitivity thresholds to mechanical stimuli (impact and friction) were determined, and the pressure-dependent burn rate was investigated through operation in a model rocket engine. • The feasibility of using periodate-based SRPs as sources for aerosol nucleation has been experimentally established, demonstrating potential for cloud seeding and biocidal applications in crisis scenarios. • Model and analytical results were verified through numerous flight tests of experimental rocket models. 		
Applied:		
<ul style="list-style-type: none"> • The potassium nitrate/isomalt propellant was successfully tested under extreme conditions during flight trials of research rockets with dimensions and launch masses unprecedented in Bulgaria and Europe. 		

6. Conclusion

A) The evaluation of the dissertation is POSITIVE	This evaluation is assigned to a total number of at least 40 points	58
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

Based on the analysis of the dissertation work, the research carried out, the publications and the achieved results and in connection with the fact that the candidate has fulfilled the minimum requirements of the Law on DASRB, PNSZAD and PPNSZAD of UCTM for acquiring the educational and scientific degree "Doctor", I give a positive assessment of his activities and allow myself to propose to the esteemed scientific jury to accept and evaluate positively the dissertation work, the publications and the obtained results and to award Eng. Hristofor Ivanov Skandaliev, the scientific degree "Doctor", in the scientific speciality "(Technology of natural and synthetic fuels", professional direction 5.10. Chemical technologies, a field of higher education 5. Technical sciences.

28.05.2026	The report was written by:	
date	Emil Georgiev Mihailov	signature