Doctoral thesis review

Thesis subject: **Study of Energetic Compositions Based on Explosives Mixtures and Cocrystals**

Author: **Eng. Ahmed HUSSEIN, M.Sc.**

Reviewer: **Prof. Eng. Pavel KONEČNÝ, Ph.D.**

Doctoral thesis contains 175 pages. The actual thesis text is written on 149 pages and is logically divided into 7 chapters. It contains all necessities required on the dissertation thesis. Student has chosen the theme which is highly actual for further development of the insensitive energetic materials.

For compliance of thesis theme student set the relatively difficult goal in innovation of new mixtures using of insensitive explosive or changeable ration of nitramines in different polymeric matrix.

Chapter one: Present knowledge of basic pure nitramine explosives, mixtures, PBXs, available binders and mixture explosive on base of cocrystals, their properties and preparation technologies has been introduced.

Chapter two: Methods of samples preparation are described. In the next part, the measurement methods used for assessment of samples properties, tools for calculation of thermal and detonation properties and methods of sensitivity measurement are introduced.

Chapter three: The selected insensitive mixtures based on BCHMX, NTO and FOX-7 are analysed. Large amount of samples has been prepared, tested and analysed by the methods described in chapter two.

Chapter four: Similarly to chapter three, the plastic bonded explosives based on various mixtures of three nitramines – BCHMX, RDX and HMX are analysed. Various formulas of introduced nitramines has been prepared using of selected binders.

Chapter five: Similarly to chapter three, the mixtures of cocrystals EDNA/DAT are analysed.

All three chapters contain theoretical calculation of detonation, thermal and kinetic parameters, results of physical characteristics measurement, experimentally obtained detonation, thermal and kinetic parameters and results of sensitivity measurement of samples. All results are compared with the basic explosives in form of tables and graphs. Experimental results are compared with results of theoretical solution. There is very good agreement of introduced experimental and theoretical results which doesn't overcome at any case 5 %.

Chapter six: Relationship of the nitramine energetic materials performance and their sensitivity is analysed. The results of introduced comparison bring new and very interesting information in trend of development of new insensitive mixtures of energetic materials.

Chapter seven: Conclusion. Student summarizes the results of the thesis and claims, that the goal of thesis is fulfilled.

Thesis is elaborated in the required quality. The goal of thesis has been fulfilled. Obtained results are based on a big amount of experiments. It is excellent benefit of the thesis. The significant drawback hasn't been found.

The Summary of the doctoral thesis corresponds to the main characteristics of thesis and it is possible correctly to deduce the main contribution of student for the development of the field of study.

Doctoral thesis is the original work of student. All references used in thesis are correctly denoted.

Number of student's publications related to the thesis is sufficient. Student is author of 8 papers and co-author of 2 papers in impact international journals. He presented results of his work on 5 international conferences.

The formal level of text is very good except several typing errors and mistakes in sentences, which make the text locally less understandable.

Conclusion

Doctoral thesis of Eng. Ahmed Hussein completes the conditions introduced in §47, clause 4 of the University Act. Student proved the ability to the individual scientific work. He brings the new pieces of knowledge in thesis for further development of scientific branch.

I recommend to submit the doctoral thesis to the dissertation defence.

Brno, September 10, 2018

Prof. Eng. Pavel Konečný, Ph.D.