Analytical Studies and Performance Characteristics for Some Solid Propellants.

Presented by

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APPROVAL SHEET FOR SUBMISSION

Thesis Title:

Analytical Studies and Performance Characteristics for Some Solid Propellants.

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ABSTRACT

Student Name: Farag Sobh Farag Mohamed Helal

Title of the thesis: Analytical Studies and Performance Characteristics for Some Solid Propellants.

Degree: The Master of Science (Chemistry)

The influence of different burning rate modifiers (catalysts) on the double base rocket propellants was studied. HPLC, GC and AAS were used to investigate and check the components of the propellant samples. Able heat test, Bergman & Junk test, methyl violet test, Lenze & Pleuss test, explosion temperature and calorimetric value were used to study the effect of these modifiers on thermal stability of these propellants. Mechanical properties (maximum stress, strain at maximum stress, young's modulus…etc) which very important for good functioning of the propellants during their uses and storage were measured by compression test at two different temperatures (50 and 25°C). The effect of the burning rate modifiers on the thermal decomposition of these propellants was studied by TGA, DSC and DTA. The kinetic parameters for this decomposition were calculated by Ozawa and Kissinger methods. Catalysed propellants decomposed at lower temperatures than the control. Rate constants were higher and energy of activation was lower for catalysed propellants. Results obtained from TGA, DSC and DTA suggest that the investigated modifiers led to some improvement in ballistic performance characteristics of these propellants. The ballistic performance characteristics of the double base propellants were measured at two different temperatures (+50 and -20°C) by Teledyne Taber bonded strain gage pressure transducer (stand test). Results obtained from this test showed that the used burning rate modifiers impart some enhancement in these characteristics through stable combustion and formation of plateau region at low pressure.

Keywords: **Propellants, double base propellants, burning rate modifiers, HPLC, GC and AAS, Able, Bergman & Junk, methyl violet, explosion temperature and calorimetric value tests, comparison test, TGA, DSC and DTA, kinetic parameters, Ozawa and Kissinger methods and ballistic performance characteristics.**

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Besides the work carried out in this thesis, the candidate **Farag Sobh Farag Mohamed** had studied the following post-graduate courses during the academic year 2006-2007 and passed their exams successfully.

- Coordination Chemistry
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- Analytical Chemistry
- Computer Programming
- Spectroscopic Methods for Structures
- Separations Techniques
- German Language
- English Language
- Cyclic Voltammetry
- Thermodynamics
- Statistical Thermodynamics
- Applied Physical Chemistry
- Bioinorganic Chemistry
- Inorganic Reaction Mechanism
- Kinetic chemistry
- Organmetallic Chemistry

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Farag Sobh Farag Mohamed Helal

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