

**Analytical Studies and Performance Characteristics
for Some Solid Propellants.**

Presented by

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Faculty of Science
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ABSTRACT

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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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LIST OF CONTENTS

Subject	Page No.
ACKNOWLEDGEMENT	
AIM OF THE WORK	
CHAPTER I: INTRODUCTION	
I.1- Introduction.	1
I.2- Solid Rocket Propellants.	4
I.3- Propellant Chemistry.	5
I.3.1- Single Base Propellant (SB).	5
I.3.2- Double Base Propellant (DB).	7
I.3.3- Triple Base Propellant (TB).	8
I.3.4- Composite Propellants.	8
I.4- Stabilizers of Propellants.	9
I.5- Burning Modifying Agents.	11
I.6- Burning Accelerators or Regulators.	11
I.7- Ballistic Additives.	11
I.8- Ballistic Performance Characteristics of Double Base Propellants.	13
CHAPTER II: LITERATURE SURVEY	
II.1- Ballistic Performance on Solid Propellants.	15
II.2- Thermal Measurements and Combustion Mechanism of Solid Propellants.	18
II.3- Mechanical Properties of Solid Rocket Propellants.	23
II.4- Thermal Stability of Solid Propellants.	24
II.5- Extraction and Analytical Methods.	25
CHAPTER III: EXPERIMENTAL	
III.1- Materials and Chemicals	31
III.2- Solutions	31
III.3- Instruments	32
III.4 -The Manufacturing Process of Extruded Double Base Rocket Propellant Samples.	32
III.4.1- Reminder of the Functional Role of The process.	32

Subject	Page No.
III.4.1.1- Homogenization.	32
III.4.1.2- Gelatinization.	33
III.4.2- Impregnation of Nitrocellulose with Nitroglycerine.	33
III.4.3- Drying of The paste.	33
III.4.4- Kneading.	33
III.4.5- Gelatinization: rolling operations.	34
III.4.6- Carpet rolling of milled sheets.	34
III.4.7- Extrusion.	34
III.4.8- Cutting and Machining.	35
III.4.9- X- ray Test.	35
III.5- The investigated Double Base Rocket Propellants Samples.	37
III.6- Chemical Analysis.	37
III.6.1- Sample Extraction	37
III.6.2- High Performance Liquid Chromatography (HPLC).	38
III.6.3- Gas Chromatography (GC).	39
III.6.4- Atomic Absorption Spectroscopy (AAS).	39
III.7- Thermal Stability Tests	40
III.7.1- Lenze & Pleuss Stability Test at 100 °C.	40
III.7.2- Able Heat Test at 80 °C.	40
III.7.3- Methyl Violet Test Paper at 120 °C.	41
III.7.4- Bergmann & Junk Stability Test at 120 °C.	41
III.7.5- Explosion Temperature.	42
III.7.6- Calorimetric Value (Calorific value).	42
III.8- Mechanical Measurements (Compression Test)	43
III.9- Thermal Measurements	45
III.9.1- Thermogravimetric and its Derivative Analysis (TG-DTG).	45
III.9.2- Differential Thermal Analysis (DTA).	45
III.9.3- Differential Scanning Calorimetry (DSC).	45
III.9.4- Kinetic Parameters.	45
III.9.4.1- Model Analysis Based on Kissinger and Ozawa Kinetic Approach.	45
III.9.4.2- Kissinger-Akahira-Sunose method (KAS) Method.	46

Subject	Page No.
III.9.4.3- Ozawa Method (Ozawa-Flynn-Wall Method (OFW)).	47
III.10- Ballistic Performance Measurements.	48
CHAPTER IV : RESULTS AND DISCUSSION	
IV.1- Chemical Analysis of Double Base Rocket Propellants.	49
IV.1.1- Chromatographic methods.	49
IV.1.1.1- High Performance Liquid Chromatography (HPLC).	49
IV.1.1.2- Gas Chromatography (GC).	49
IV.1.2- Atomic Absorption Spectroscopy (AAS).	56
IV.2- Thermal Stability of Double Base Rocket Propellants.	57
IV.3- Mechanical properties of Double Base Rocket Propellants.	61
IV.4- Thermal Measurements of Double Base Rocket Propellant.	66
IV.4.1- Thermogravimetric Measurement and its Derivative (TG-DTG).	67
IV.4.2- Differential Scanning Calorimetry (DSC).	71
IV.4.3- Kinetic Parameters of The thermal Decomposition.	75
IV.4.3.1- Ozawa Method (Ozawa-Flynn-Wall Method (OFW)).	75
IV.4.3.2- Kissinger method (Kissinger-Akahira-Sunose method (KAS)).	76
IV.4.4- Differential Thermal Analysis (DTA).	86
IV.5- Ballistic performance of Double base Rocket Propellants.	92
IV.5.1- Chamber Pressure-Time Curves.	93
IV.5.2- Pressure Burning Rate Curves.	109
REFERENCES	121
SUMMARY	131
ARABIC SUMMARY	

LIST OF TABLES

Table No.	Page No.
Table 1: Classification of explosive materials.	2
Table 2: The investigated double base rocket propellants samples.	37
Table 3: HPLC mobile phase components.	38
Table 4: The operating conditions for determination of lead and copper content in investigated samples by AAS.	39
Table 5: Operating conditions of compression test.	44
Table 6: HPLC results of the investigated double base rocket propellants.	50
Table 7: GC results of the investigated double base rocket propellants.	51
Table 8: AAS results for the investigated double base rocket propellant samples.	56
Table 9: Results of stability tests for the investigated propellant samples.	58
Table 10: Mechanical properties of the investigated propellant samples at +50 and 25 °C.	62
Table 11: Decomposition Temperatures of The investigated Double Base Rocket Propellant Samples.	67
Table 12: DSC results of the investigated double base rocket samples.	72
Table 13: Kinetic Parameters obtained by Ozawa and Kissinger Methods from TGA curves of the investigated Double Base Rocket Propellant Samples.	76
Table 14: DTA results of thermal decomposition temperature of the investigated double base rocket propellant samples and their burning rate modifiers.	87
Table 15: Characteristics of ballistic performance of double base rocket propellant samples at + 50°C.	112
Table 16: Characteristics of ballistic performance of double base rocket propellant samples at + 25°C.	113

LIST OF FIGURS

Figure No.	Page No.
Figure 1: Chemical structure of nitrocellulose and the most commonly used inert and energetic plasticizers.	6
Figure 2: Chemical structure of the popular ballistic modifiers.	12
Figure 3: Relation between $\log r_b$ and $\log P_c$ for double base rocket propellant.	14
Figure 4: Super-rate, plateau, and mesa characteristics of double base propellants.	17
Figure 5: Zwick universal mechanical testing machine model 1487.	44
Figure 6: A simplified diagram for the test stand.	48
Figure 7: HPLC chromatogram of the double base rocket propellant sample 1.	51
Figure 8: HPLC chromatograms of the double base rocket propellant samples (2-4)	52
Figure 9: HPLC chromatograms for double base rocket propellant samples (5-7).	53
Figure 10: GC chromatograms for the double base rocket propellant samples (1-3)	54
Figure 11: GC chromatograms for the double base rocket propellant samples (4-7).	55
Figure 12: Able heat test at 80°C for double base rocket propellant samples (1-7).	59
Figure 13: Methyl violet test at 120°C for double base rocket propellant samples (1-7).	59
Figure 14: Bergman&Junk test at 120°C for double base rocket propellant samples (1-7).	60
Figure 15: Expollosion temperature test for double base rocket propellant samples (1-7).	60
Figure 16: Calorimetric value results for double base rocket propellant samples(1-7).	61
Figure 17: Young's modulus for double base rocket propellant samples (1-7) at +50 °C.	63
Figure 18: Maximum stress for double base rocket propellant samples (1-7) at +50 °C.	63
Figure 19: Strain at maximum stress for double base rocket propellant samples (1-7) at +50 °C.	64
Figure 20: Young's modulus for double base rocket propellant samples (1-7) at +25 °C.	64
Figure 21: Maximum stress for double base rocket propellant samples (1-7) at +25 °C	65
Figure 22: Strain at maximum stress for double base rocket propellant samples (1-7) at +25 °C.	65

Figure No.	Page No.
Figure 23: TGA and DrTGA curves of double base rocket propellant samples (1-3).	68
Figure 24: TGA and DrTGA curves of double base rocket propellant samples (4-6).	69
Figure 25: TGA and DrTGA curves of double base rocket propellant samples (7- 9).	70
Figure 26: DSC Curve of double base rocket propellant sample (1).	72
Figure 27: DSC Curves of the investigated double base rocket propellant samples (2-5).	73
Figure 28: DSC Curves of the investigated double base rocket propellant samples (6-9).	74
Figure 29: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 1.	77
Figure 30: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 2.	77
Figure 31: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 3.	78
Figure 32: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 4.	78
Figure 33: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 5.	79
Figure 34: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 6.	79
Figure 35: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 7.	80
Figure 36: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 8.	80
Figure 37: Relation between $\log \beta$ (heating rate) and $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 9.	81
Figure 38: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 1.	81
Figure 39: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 2.	82
Figure 40: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 3.	82
Figure 41: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 4.	83
Figure 42: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 5.	83
Figure 43: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 6.	84

Figure No.	Page No.
Figure 44: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 7.	84
Figure 45: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 8.	85
Figure 46: Relation between $\log (\beta/T_m^2)$ versus $1/T_m$ at conversions from $\alpha = 0.1$ to $\alpha = 0.9$ for the sample 9.	85
Figure 47: DTA Curves of double base rocket propellants samples (1-3).	88
Figure 48: DTA Curves of double base rocket propellants samples (4-6).	89
Figure 49: DTA Curves of double base rocket propellants samples (7-9).	90
Figure 50: DTA Curve of lead salts:- a- Lead stearate. b- Lead salicylate. c- Lead β -resorcylate.	91
Figure 51: DTA Curves of copper salts:- a- Copper salicylate. b- Copper acetate.	92
Figure 52: Burning chamber pressure-time curves a- Stable b- Oscillatory. c- Irregular.	93
Figure 53: The p/t curves of sample 1 at +50 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	95
Figure 54: The p/t curves of sample 2 at +50 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	96
Figure 55: The p/t curves of sample 3 at +50 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	97
Figure 56: The p/t curves of sample 4 at +50 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	98
Figure 57: The p/t curves of sample 5 at +50 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	99
Figure 58: The p/t curves of sample 6 at +50 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	100
Figure 59: The p/t curves of sample 7 at +50 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	101
Figure 60: The p/t curves of sample 1 at -20 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	102
Figure 61: The p/t curves of sample 2 at -20 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	103
Figure 62: The p/t curves of sample 3 at -20 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	104
Figure 63: The p/t curves of sample 4 at -20 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	105
Figure 64: The p/t curves of sample 5 at -20 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	106
Figure 65: The p/t curves of sample 6 at -20 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	107
Figure 66: The p/t curves of sample 7 at -20 °C using throat diameters a-8mm b-8.5mm c-9mm d-9.5-mm.	108
Figure 67: Relation between $\log p_c$ and $\log r_b$ for samples (1 and 2) at + 50 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	114

Figure No.	Page No.
Figure 68: Relation between $\log p_c$ and $\log r_b$ for samples (3 and 4) at + 50 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	115
Figure 69: Relation between $\log p_c$ and $\log r_b$ for samples (5 and 6) at + 50 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	116
Figure 70: Relation between $\log p_c$ and $\log r_b$ for sample (7) at + 50 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	117
Figure 71: Relation between $\log p_c$ and $\log r_b$ for sample (1) at -20 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	117
Figure 72: Relation between $\log p_c$ and $\log r_b$ for samples (2 and 3) at -20 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	118
Figure 73: Relation between $\log p_c$ and $\log r_b$ for samples (4 and 5) at -20 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	119
Figure 74: Relation between $\log p_c$ and $\log r_b$ for samples (6 and 7) at -20 °C using throat diameters (8, 8.5, 9 and 9.5 mm).	120

LIST OF SCHEMES

Scheme No.	Page No.
Scheme 1: Sequential and competitive degradation mechanism of diphenylamine stabilizer.	10
Scheme 2: Summarized the steps included in the manufacturing process of the studied double base propellants.	36

Aim of the work