STUDYING THE EFFECT OF NEW ADDITIVES ON THE CHARACTERISTICS OF SOME POLYURETHANE ELASTOMERS

By

Eng. Ahmed Mohammed Aboelmagd Salem

A Thesis Submitted to the
Chemical Engineering Department
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of

DOCTOR OF PHILOSOPHY
in
CHEMICAL ENGINEERING

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Title of Thesis:

Studying the effect of new additives on the characteristics of some polyurethane elastomers.

Key Words:

polybutadiene（HTPB）/ hexamethylene diisocyanate (HMDI) composite solid propellant; plasticizers; antioxidants; burning rate modifiers; aging program

Summary:

During propellant life time, the material has to resist various loads and environmental conditions. The main objective of this work is to increase the life time of the composite solid propellant rocket motor by studying the effect of some new additives such as plasticizers, antioxidants and burning rate modifiers on improving the mechanical and ballistic properties. Applying aging program for 90 days at assigned temperature 70°C.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Date:

Signature:

Dedication

I dedicate my thesis to my family especially my wife **Manal Moubarak**.

Acknowledgments

At the beginning, I definitely want to thank the almighty **ALLAH** for making it all possible.

I would like to express my gratitude to my supervisor **Prof. Dr. Ehab Fouad Abadir** – Chemical Engineering Department – Faculty of Engineering – Cairo University, for providing me with his constant support, encouragement and guidance. His enthusiasm and willingness to allow me to pursue my own interest have been much appreciated.

I would also like to express my gratitude to **Prof. Dr. Sahar Mohamed El-Marsafy** – Chemical Engineering Department – Faculty of Engineering – Cairo University, my consultant for her encouragement, valuable advices, useful discussions and endless support.

Special thanks and appreciation are due to **Col. Dr. Tarek Elhedery** – Egyptian Armed Forces, who was involved in teaching me and enhancing my experience.

I also wish to express my deepest gratitude to all members of the Chemical Engineering Department in Cairo University. In addition, I would like to thank my friends especially **Col. Dr. Karim Karam Elsharkawy** with whom I had shared a remarkable good time.

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Nomenclature

Al	Aluminum.
AP	Ammonium Perchlorate.
B.A	Bonding Agents.
BAMO	3.3-Bis(AzidoMethyl) Oxetane
CSM	Composite Solid Motor
CSP	Composite Solid Propellant.
CTPB	Carboxy Terminated Poly Butadiene.
DOS	Diisooctyl Sebacate.
DOZ	Diisooctyl Azelate.
Cyanox 2246	2,2'-methylenebis(4-methyl-6-tert-butylphenol)
AO	N,N′-Diphenyl-p-phenylenediamine
BF	Barium ferrite
CC	Copper chromite
FO	Ferric oxide
DMA	Dynamic Mechanical Analysis.
DSC	Differential Scanning Calormitry
FTIR	Fourier Transfer Infra Red
HMDI	Hexamethylene diisocyanate.
HMX	Octagen
HTPB	Hydroxy terminated poly butadiene.
HX-752	l,l(Phenyl Dicarbonyl) bis (2- Methyl Aziridine).
IPDI	Isophoron diisocyanate.
Is	Specific Impulse
MAPO	Tris [l-(2-methyl) aziridinyl] phosphine oxide.
MAT4	Condensation Reaction of 2.0 mole MAPO, 0.7mole Adipic Acid, and 0.3 mole Tartaric Acid.
NCO	Miligram equivalent of isocyanate per gram of diisocyanate.
PMAA	Poly Methyl Acrylic Acid.