AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
ELECTRICAL POWER AND MACHINES DEPT.

STUDY OF POLYMER INSULATING MATERIALS UNDER SALT-FOG CONDITIONS

A Thesis

Submitted in Partial Fulfillment for

the Requirement of the Degree of Master

of Science in Electrical Engineering

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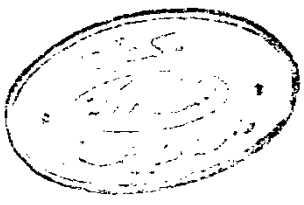

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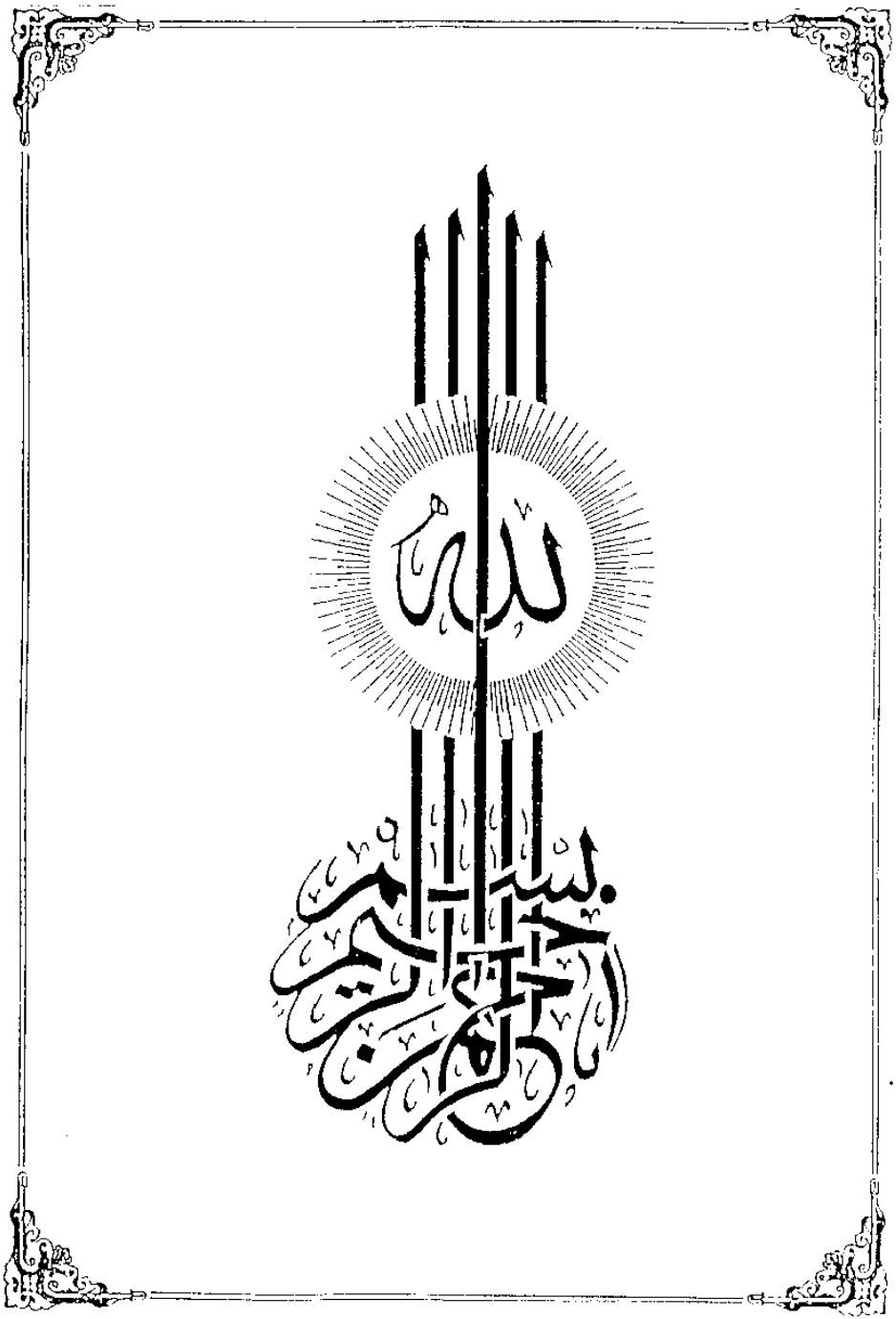

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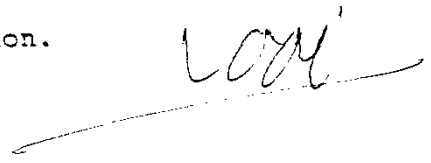
STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master in Electrical Engineering.

The work included in this thesis was carried out by the author. No part of this thesis has been submitted for a degree or a qualification.



ACKNOWLEDGEMENT

I have the great honor to express my deepest gratitude and sincerest thanks to **Prof. Dr. Abdel-Razak Nosseir**, chairman of the Electric power & Machines Department, Faculty of Engineering, Ain Shams University, for his kind supervision, guidance and continuous encouragement and for his helpful and fruitful discussions in the preparation of this thesis.

I would also like to thank **Prof. Dr. A. Soliman**, for his valuable advices, great assistance and all facilities be offered during the progress of this work.

I have greatly indebted to **Dr. M. S. Rizk**, for his guidance and unfailing discussions and for every good help until the thesis has been developed.

I feel deeply thankful to **Dr. N. L. Doos**, for her useful suggestions and for her supervision in chemical preparation which was carried out in the laboratory of Polymers and Pigments-National Research Center.

Finally, I owe a great part of research study to the H.V. Laboratory Staff in the Electrical Department and to all those who assisted me in the accomplishment of this work.

ABSTRACT

Organic martials such as polyethylene, rubbers, epoxies and polyesters are widely used as insulating materials for many reasons such as; economy, strength and ease fabrication to good tolerance. As a result of the development which have taken place recently, these materials can be produced with various electrical, thermal and mechanical properties according to their intended purpose.

Polymeric insulators are subjected to a variety of surface stresses such as heat, sunlight, moisture and contamination which can cause degradation of their characteristics. Therefore, for satisfactory operation of the insulation, it is important to assess the effects of the various environmental degradation factors on the tracking and erosion performance of the material in use.

Therefore, the aim of this work is to study the electrical performance of polymer materials under different testing conditions. Cylindrical samples prepared from polyester with styrene monomer have been examined experimentally in atmospheric air conditions. The ac (50 Hz) and dc flashover voltages have been measured for different sets of samples under different testing conditions. In addition the ac (50 Hz) surface aging of the polyester samples has been investigated under salt fog conditions. Inorganic fillers are incorporated into the polyester/styrene to enhance the physical and electrical properties in addition to minimize the effects of tracking and / or erosion.

The effects of adding inorganic fillers such as; Kaolin (K), Felspar (F) and Quartz (Q) with different quantities on the electrical performance of polyester / styrene have been studied.

Finally the main salient points of this work have been summarized and presented, indicating the important of this study as polymers are presently being used worldwide in highly competitive and advance power industry.

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LIST OF ABBREVIATIONS

H.V: High Voltage.

MEK: Methyl-Ethyl Ketone.

Co-naph: Cobalt naphthenate.

RTV: Room Temperature Vulcanized.

HTV: High Temperature Vulcanized.

P_a: Sample Chemically prepared at curing temperature equal 20°C.

P_b: Sample Chemically prepared at curing temperature equal 40°C.

P_c: Sample Chemically prepared at curing temperature equal 60°C.

P_d: Sample Chemically prepared at curing temperature equal 80°C.

K: Kaolin.

F: Felspar.

Q: Quartz.

K_i: Sample with 4% percentage of Kaolin.

K_{ii}: Sample with 16% percentage of Kaolin.

K_{iii}: Sample with 28% percentage of Kaolin.

K_{iv}: Sample with 44% percentage of Kaolin.

F_i: Sample with 4% percentage of Felspar.

F_{ii}: Sample with 16% percentage of Felspar.

F_{iii}: Sample with 28% percentage of Felspar.

F_{iv}: Sample with 44% percentage of Felspar.

Q_i: Sample with 4% percentage of Quartz.

Q_{ii}: Sample with 16% percentage of Quartz.

Q_{iii}: Sample with 28% percentage of Quartz.

Q_{iv}: Sample with 44% percentage of Quartz.

NaCl: Sodium Chloride.

LIST OF TABLES