POSITRON ANNIHILATION SPECTROSCOPIC STUDY OF POLY(CHLOROTRIFLUOROETHYLENE) UNDER THE INFLUENCE OF COMPRESSION, ELONGATION AND AGING

THESIS

SUBMITTED TO THE UNIVERSITY OF MYSORE
FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY
IN PHYSICS

By

P. RAMACHANDRA

Supervisor

Dr. C. Ranganathaiah

DEPARTMENT OF STUDIES IN PHYSICS
UNIVERSITY OF MYSORE
MANASAGANGOTRI, MYSORE-570 006
INDIA

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IN FOND MEMORY OF

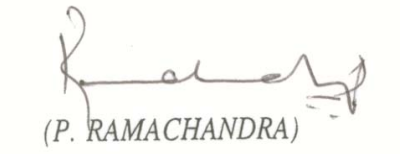
Late Smt. PUTTARANGAMMA

and

Late Smt. MAHADEVAMMA

DECLARATION

I hereby state that this thesis entitled **"POSITRON ANNIHILATION SPECTROSCOPIC STUDY OF POLY (CHLOROTRIFLUOROETHYLENE) UNDER THE INFLUENCE OF COMPRESSION, ELONGATION AND AGING"** *has been revised by myself under the guidance of Prof C.Ranganathaiah incorporating the suggestions of the Indian examiner. The thesis in its present form is in conformity with the recommended suggestions of the examiner.*



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DECLARATION

I hereby state that this thesis entitled **"POSITRON ANNIHILATION SPECTROSCOPIC STUDY OF POLY(CHLOROTRIFLUORO-ETHYLENE) UNDER THE INFLUENCE OF COMPRESSION, ELONGATION AND AGING"** *has been composed by myself and comprises the results of my investigations carried out in the Department of Studies in Physics, University of Mysore, Manasagangotri, Mysore under the supervision of Dr.* C. *Ranganathaiah, Reader in Physics.*

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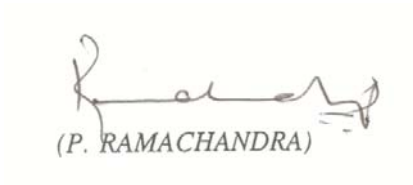

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CERTIFICATE

I certify that Mr. P. Ramachandra has revised the thesis independently incorporating the suggestions of the Indian examiner under my supervision. Now the thesis is suitable for revaluation.

Mysore
August, 1998

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20/8/98

CERTIFICATE

I certify that this thesis comprises of the bonafide research work done by Mr. P. Ramachandra independently under my guidance and supervision.

Mysore
September, 1997

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PREFACE

The conventional inorganic materials such as metals fail under adverse environmental conditions. Because of the excellent barrier properties, the organic materials such as polymers soon replaced the conventional materials. In order to use these materials effectively under various conditions, basic understanding of the defect nature of these materials is highly essential. Eversince the existence of free volume was postulated, this has become an interesting topic in polymer research. There has been a constant effort to understand the polymer properties in terms of free volume. Since, the dimensions of free volume holes are of sub-microscopic level, only few experimental techniques are available to characterize them. One among them is the Positron Annihilation Lifetime technique which has proved to be a novel technique to characterize the defects in condensed media. This is because of the fact that positrons and positronium preferentially scan the defects/ open volumes like free volumes. Since the annihilation characteristics can be measured accurately, the information on defects/ free volumes can be derived from positron annihilation parameters.

This thesis is divided into seven chapters. Chapter I gives an introduction to polymers and to the theory of positron annihilation technique. A brief description of Positron Lifetime Spectrometer and functioning of various components is provided in chapter II. Chapter III gives the author's investigation on Poly(chlorotrifluoroethylene)-PCTFE with different concentration of VF_2 comonomer viz., 22A, TVS and HP when subjected to elongation and compression. Chapter IV provides a brief theory on physical aging process in polymers and aging results on 22A and HP. Chapter V provides the author's investigation on the annealing behavior of 22A, TVS and HP. The results on the annealing behavior of strained HP and compressed 22A are given in chapter VI. Finally, the salient features of the thesis are provided in chapter VII.

(P. RAMACHANDRA)

Mysore

September 1977

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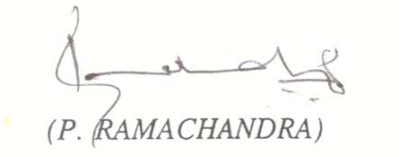

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CONTENTS