

**INVESTIGATIONS ON THE PERSISTENT POLARISATION  
AND DIELECTRIC RELAXATION IN POLY METHYL-  
METHACRYLATE AND POLYSTYRENE  
DOUBLE LAYER SYSTEMS**

By

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*Thesis Submitted  
in fulfilment of the requirements  
for the Degree of  
DOCTOR OF PHILOSOPHY*



TO THE  
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July, 1987

To my father  
in heaven

CERTIFICATE

I am satisfied that the thesis entitled  
'Investigations on Persistent Polarisation and Dielectric  
Relaxation in Poly (methyl methacrylate) and Polystyrene  
Double Layer Systems' submitted by PARAMDEEP KHURANA is  
worthy of consideration for the award of the degree of  
DOCTOR OF PHILOSOPHY and is a record of the original  
bonafide research work carried out by her under my  
guidance and supervision and that the results contained  
in it have not been submitted in part or full to any  
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### Abstract

Polymer blends and double layers are attracting a lot of attention these days. Numerous reports are available about the work done on polymers by thermal and mechanical techniques. These investigations have shown that not only a better and commercially viable product can be obtained, but a polymer can be tailored <sup>to</sup> suit specific usage by polymer compounding. Although, persistent polarisation phenomenon has been studied in polymers by several workers because of the commercial use of electrets, but a detailed study of its nature in double layer system has seldom been undertaken. The work presented in this thesis essentially probes into the nature of polarisation and dielectric relaxation phenomena in polymer double layered systems of poly(methyl methacrylate) and polystyrene.

Out of various applications of electrets, the study of the use of electret in identification of gaseous pollutants has been undertaken in more detail.

Thermoelectrets of polymers with stable surface charge on both sides are suitable devices for attracting and collecting charged particles and ions on to their surfaces and holding them for a very long time. It is also possible to induce charges of opposite sign on neutral particles and attract them to the surface of the electret. The gaseous contamination collection properties of electrets

have been evaluated by mass spectral analysis and SEM of the exposed sample.

The details of sample preparation and measurement techniques employed in the present studies are given in Chapter 2.

In Chapter 3, polarisation and relaxation phenomena have been analysed using the thermally stimulated discharge current technique.

Chapter 4, deals with <sup>the</sup> study of dielectric properties on application of A.C. field.

D.C. conductivity studies have been presented in Chapter 5.

The use of electrets in <sup>the</sup> detection of various pollutants has been presented in Chapter 6.

In Chapter 7, the results of all the studies have been summarised and the conclusions drawn from these investigations have also been mentioned.

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