

**PERSISTENT POLARIZATION STUDIES IN
THE POLYBLEND OF
POLY (METHYL METHACRYLATE) AND
POLY (VINYL ACETATE)**

By
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Centre for Materials Science & Technology

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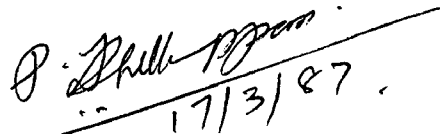
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MARCH, 1987

TO MY PARENTS

C E R T I F I C A T E

We are satisfied that the thesis entitled "Persistent Polarization Studies in the Polyblends of Poly (Methyl Methacrylate) and Poly(Vinyl Acetate)" by R. Sekar is worthy of consideration for the award of the degree of DOCTOR OF PHILOSOPHY and is a record of original bonafide research work carried out by him under our guidance and supervision and that the results contained in it have not been submitted in part or full to any other university or Institute for award of any degree/diploma.


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ABSTRACT

Since mid seventies polyblends have become a part of the macromolecular science and they have gained commercial and technological importance, because blending allows one to create a new material with useful properties through simple physical process rather than expensive chemical means.

The understanding of electrical and dielectric behaviour of polyblends will be useful not only in getting a clear picture of the molecular motion but also in selecting them for the applications in fields such as electrets and electrophotography etc.,. However reports on the electrical properties of polyblends are very few. The present thesis reports the studies carried out to understand structural and electrical properties of Poly(Methyl Methacrylate) (PMMA) and Poly(Vinyl Acetate) PVAc Polyblends.

The work is presented in seven Chapters. In the first Chapter a brief survey of electret and their applications are given as the polyblends are used for the preparation and characterization of electrets. The available literature on polymers, polyblends and the response of polymeric materials to electric field have also been reviewed in this Chapter.

The second Chapter gives the details of the materials studied as well as the methods of sample preparation, along with the experimental techniques used. Some structural

properties of the polyblends are also discussed in this Chapter.

The electrical conductivity studies on the polyblends of PMMA and PVAc are discussed in Chapter 3. I-V characteristics of the polyblends suggests that the dominant charge carrier generation mechanism is Schottky-Richardson. The electrical conductivity increases and the activation energy responsible for conduction decreases as the PMMA content in the polyblend is decreased.

Dielectric dispersion phenomena in these polyblends have been studied by measuring the dielectric parameters- dielectric constant and loss factor as a function of temperature at different frequencies, using dielectric a.c. bridge measurements. The results of this study show that dipoles are becoming more and more constrained on blending these two polymers (Chapter 4).

The dielectric relaxation phenomena and the mechanism involved in the electret formation in these polyblends have been studied by using Thermally Stimulated Discharge Currents (TSDC) technique. The results of this study are discussed in Chapter 5. The influence of polarization temperature, T_p and field E_p on the TSDC spectra of the polyblends suggests that the observed polarization is due to the orientation of induced dipoles resulting from the deep trapping of charge carriers during polarization. The dielectric relaxation parameters are also reported in this Chapter. The observed results are in

agreement with that of dielectric a.c. bridge measurements and electrical conductivity studies.

The electrophotographic characteristics of Copper-phthalocyanine (CuPh):Poly (Methyl Methacrylate) (PMMA) and CuPh: Polyblend have been studied and the results are given in the sixth Chapter. It has been found that the polyblend is a better binder than PMMA alone.

In the last Chapter the summary of the conclusions drawn on the basis of the above mentioned studies are given.

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