INTRODUCTION

Dielectric behavior of pure polar liquids and polar liquids in non-polar solvents under the application of electric field of suitable frequency has been a subject of investigation for many years and their different aspects were emphasized in different periods.

In 1912 P Debye was successful to extend the Clausius-Mosotti relation and showed that the dielectric constant depends not only on the molecular polarizability, but also on the permanent electric moment of the molecules. He explained with the help of this concept of molecular permanent dipole moment, the anamolous dispersion of dielectric constant which was observed by Drude (1904) and other workers. Debye further pointed out that the process of orientation of the permanent electric moment connected with the change in the electric field, requires a definite time interval, since it depends on the rotational movements accomplished by the molecules. It follows from the assumption that after removal of an externally applied electric field the average dipole orientation decay exponentially with time. The characteristic time of such decay is called the relaxation time.

It was found experimentally that relaxation time depends on temperature. This led to consider the dielectric phenomenon as a rate process.

A large number of workers have proposed several modifications and extensions of Debye theory of dielectric absorption.The replacement of single relaxation time by a set of relaxation times was soon developed to describe the macroscopic relaxation process. In order to support the experimental results the introduction of distribution of relaxation times was also proposed in many cases. Cole and Cole, and Cole Davidson however, offered important graphical methods called Cole-Cole and Cole-Davidson plots to distinguish these cases from that of single relaxation time. It appears from the above discussion that further improvement in the theory of dielectric absorption and dispersion could, however, be made for a better understanding of the dielectric relaxation phenomena to throw much light on the molecular and intramolecular structures of the polar liquids in pure state and in solution also.

Thus in order to get a clear picture of the subject of dielectric polarization and its relation with shape, size and structure of polar molecules, a brief survey of the development of various theories of dielectric polarization and their extension and modifications together with a brief review of earlier works are given in the following section. The scope and the objects of the present works are given in the second chapter together with the radio frequency experimental technique and

theories of measurements. The rest of the subject matters of this thesis is distributed several chapters. The last chapter contains the results and conclusion of the present investigation.