

## C O N T E N T S

	Page No.
Introduction	1
Chapter - I	
1.0 A brief survey of the theories of dielectric polarization , dielectric conduction together with a brief review of previous works	3
1.1 Debye theory of dielectric polarization and complex dielectric constant	3
1.2 Physical interpretation of dielectric loss ( $\epsilon''$ ) and loss tangent ( $\tan \delta$ )	10
1.3 Dielectric constant and loss	12
1.3.a Dielectric loss and relaxation time	12
1.3.b Distribution of relaxation time	16
1.3.c Representation of permittivity in the complex plane	17
1.3.d Cole - Cole distribution	18
1.4. Expression for dielectric relaxation in dilute solution of polar molecules in non-polar solvent	19
1.5.a Dielectric loss and high frequency conductivity	22
1.5.b High frequency conductivity of dielectric polar molecules	26

1.5.c	High frequency conductivity of dilute solution of polar molecules in non-polar solvent	27
1.6.a	Relaxation time ( $\tau$ ) and its relation with microscopic and macroscopic properties	28
1.6.b	Modification of Debye's relation	30
1.7.	Radio frequency conductivity of polar dielectric liquids and relaxation time	31
1.8.	Ultra high frequency conductivity or microwave conductivity of polar molecules in dilute solution of non polar solvent	35
1.9	A brief review of the early works	36
1.10	Scope and object of the present investigation	66
1.11	Bibliography	71
<b>Chapter - II</b>		
2.0	Experimental technique and theories of measurement	81
2.1	Theory of measurement and experimental arrangement for determining radio frequency conductivity	82

2.2	Theory of determination of dipole moment	87
2.3a	Activation energy for dipole rotation	88
2.3.b	Activation energy for viscous flow	89
2.4	Theory of least square fit method	90
2.5	Determination of Co-efficient of viscosity of the liquid	92
2.6	Purification of liquids	93
2.7	Washing and cleaning of the dielectric cell	93
Chapter - III		
3.0	Microwave conductivity and dipole moment of polar dielectrics	95
Chapter - IV		
4.0	Microwave conductivity and dipole moment of some substituted benzene	112
Chapter - V		
5.0	Ultra - high frequency conductivity of polar non-polar liquid mixtures	123
Chapter - VI		
6.0	Conductivity, relaxation time and energy of activation of some alcohol + benzene mixture at radio frequency field	141

Chapter - VII

- 7.0 Energy of activation, dipole moment and correlation parameter of water 164

Chapter - VIII

- 8.0 Electrical conductivity anomaly in binary liquid mixtures near the critical point 177

Chapter - IX

- 9.0 Summary of the results of present work and conclusion 197

Appendix -

- 10.0 List of publications 206