CONTENTS

Acknowledgement i
List of papers published ii
Abstract iv

CHAPTER - I
MICROWAVE ABSORPTION IN GASES AND LIQUIDS

1.1 Introduction 1
1.2 Rotational line shape at low pressures 3
1.3 A brief review of earlier work on line-width studies 15
1.4 Selection of the problem 45

CHAPTER - II
PRESSURE BROADENING THEORIES IN THE MICROWAVE REGION

2.1 Introduction 48
2.2 Historical survey of theories of spectral line shape 49
2.3 Molecular collisional process 54
2.4 Pressure Broadening theory 61
2.5 Improvements in the pressure broadening impact theory 88

Continued · · · · · ·
CHAPTER III
THEORETICAL STUDY OF PRESSURE BROADENED MICROWAVE LINEWIDTH PARAMETERS

3.1 Introduction 97
3.2 A brief resume of theory 98
3.3 Method of calculation of collisional interruption function 103
3.4 Comparison of interpolation schemes in the treatment of collisional transfer of rotational energy 115
3.5 Temperature dependence of microwave linewidth of some rotational lines of OCS 126
3.6 On the consideration of phase shift effect in rotational transitions in the microwave region 139
3.7 Self broadening of rotational absorption lines of linear molecules 147
3.8 Evaluation of molecular quadrupole moment 153

CHAPTER IV
DIELECTRIC RELAXATION STUDY IN LIQUIDS

4.1 Introduction 180
4.2 Theories of static permittivities 184
4.3 Theory of Dielectric relaxation 192
4.4 Analysis of dielectric data at single frequency 198

4.5 Method of measurement 203

4.6 Measurement of permittivity and dielectric loss at 9.8 GHz and 30°C 216

4.7 Measurement on Benzophenon in Benzene solution 217

4.8 Alternative formulation for the calculation of relaxation time and dipole moment for dilute solutions at single frequency 219

4.9 Thermodynamical Parameters 221

CHAPTER - V

CONCLUSION

REFERENCES 233-263