PREFACE

Viscosity is an important property of a fluid and is a subject of investigation in its own right. Viscosity studies are finding extensive use in the study of mixture behaviour as they help in the determination of many thermodynamic properties in addition to indicating the presence of specific molecular interactions. Investigations on changes in viscosity under different physical conditions. e.g., temperature, concentration, exposure to radiation etc. are important in understanding the different dynamic processes involved at a molecular level.

In the past decade, rapid advances in the field of microelectronics have revolutionised the design of scientific instruments. Improved methods of design and the availability of very cheap components have led to high sophisticated instruments capable of performing intricate and complex functions. The use of microcomputers in the field, where many experiments are tedious and time consuming, are both desirable and essential. First, it releases the student from purely routine work and allows more time to be dedicated to other aspects, notably the theoritical principles involved and the planning of' future experiments. Second, it equips the student to the need to adapt the changing conditions to take advantage of technological innovations and new discoveries.

In the present work, we developed a semi - automatic **"Modified Ostwald Glass Capillary Viscometer"** which incorporates a microcomputer system and uses optoelectronics to detect the flow of liquid through the capillary. The flow time is determined with an accuracy of $\pm 5X10^{-6} Nsm^{-2}$.

The work presented in the dissertation is divided into three chapters. Each chapter is divided into several sections. The first one is an introductory chapter. Section1.1 consists of brief review of experimental techniques for measurement of viscosities. In this section, the different types of viscometers, their accuracy and their advantage are described. A brief review of experimental work in viscometric studies in liquids and liquid mixtures are presented in Section1.2. Different types of techniques to calculate viscosity and excess viscosity are also described in this section. The purpose and scope of the present study are highlighted in Section1.3.

Experimental techniques used in the present work form the basis of chapter2. In Section2.1 details of viscometer developed, the circuit used, experimental procedure and standardization method followed are discussed. Section2.2 describes different types of Dilatometers. In the present study we used single stem pycnometer for measuring densities with an accuracy of ±0.002% and reported densities of some pure liquids.

Temperature controller used in the present work is described in Section2.3. Accuracy of temperature control is $\pm 0.01^{o}c$ at $30^{o}c$. Section2.4 consists of the purification of organic liquids.

Last chapter is devoted to results and discussion. It consists of three sections. In the first section experimental procedure is described. Section3.2 describes the results on density, viscosity and excess viscosity measurements for the systems Benzene + Nitrobenzene and Toluene + Chlorobenzene. The last section deals with the discussion of the results.

The major conclusions of the present study are summarized as follows.

1. The microcomputer based viscometer developed in the present work measures viscosities with an accuracy of $\pm$ $5X10^{-6}Nsm^{-2}$.

2. η^{E} is found to be negative and larger in magnitude for the system Benzene + Nitrobenzene. The negative deviations indicate that dispersion forces are primarily responsible for interaction.

3. The positive deviations from rectilinear dependence on mole fraction and maxima in excess viscosity in the case of Toluene + Chlorobenzene system indicate some type of complex formation.

The conclusions drawn are confirmity with the literature.

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