INTRODUCTION

Acoustics is the study of sound, which includes its production, propagation, reception and effects on matter and living things and is thus an important field of study that makes a vital contribution to many areas of human endeavour. It relates to arts, life science and engineering. It has a rich history and dates back to last two centuries with outstanding scientists. It has today wide application to physical acoustics and ultrasonics, materials and architectural acoustics, machinery acoustics and noise control sensors and signal processing etc. The applications have gone into many advanced areas.

Ultrasound is the most viable and versatile tool in the field of pure science, medical science, biomedical engineering and industries. The propagation of ultrasonic waves through a medium depends on interaction of ultrasonic waves with the molecules of the medium. The velocity of such a wave is a thermo dynamical quantity and is related to the physico-chemical properties of the medium. The overall response of the medium is determined by the velocity and amplitude of absorption, which gives the nature of interaction between the molecules of system under investigation. Recently lot of interest has been developed in the study of solute-solute, solute-solvent and solvent-solvent interactions in non-aqueous medium. Ultrasonic technique is very useful in finding out the existence of interaction between the components of a solution.

The cohesive forces are of primary importance in liquid state. Their magnitude can be estimated from thermodynamic considerations. The acoustic, thermodynamic and the thermochemical parameters evaluated from experimental observations are used to explain the molecular association, solute-solvent interaction etc. in the solutions. The ultrasonic velocity data combined with density constitute the
standard means of determining the compressibility of a system. It is a powerful tool for studying the various interactions taking place in the system.

Molecular properties in liquids and solutions are very useful in chemical analysis where the knowledge of thermodynamic and physical properties are essential for the study of the calculations involving separations, heat transfer etc. Thermodynamic properties and their temperature dependence are potentially rich sources of information about various interactions occurring in solutions. Internal pressure is of primary importance in the properties of liquids and solutions. Variation in acoustic parameters is a measure of interaction in solutions.

Ultrasonic velocity measurement is used to throw light on various aspects of solvation chemistry including ion-ion and ion-solvent interactions. A study on solvation made with the experimentally determined parameter viz. solvation number, reveals the nature of solutions.

An analysis of equivalent conductance of solutions also yields information about the interactions occurring in solutions.

The spectrophysics has emerged as a powerful and accurate tool in investigating the molecular, atomic and nuclear systems. IR and $^1$HNMR studies provide very useful and crucial details of molecular systems. The spectral investigation of substances represents their molecular structures and hence truthfully their macroscopic properties.

In the present investigation, an attempt is made to measure the ultrasonic velocity, density, viscosity and specific conductance of Tartaric acid and Tartrate salts in Formamide and to study the behaviour of such systems with respect to the thermodynamic
parameter namely, internal pressure and free volume. The measurement of ultrasonic velocity and density is also used to evaluate the acoustic parameters such as adiabatic compressibility, specific acoustic impedance, intermolecular free length, Rao's constant, Wada's constant and van der Waal's constant and to study the nature of molecular interactions in the system.

In the present study, IR stretching and bending frequencies and $^1$HNMR chemical shifts $\delta$ of the NH proton and OH proton are used to study interactions taking place within the solutions.