ULTRASONIC VELOCITY IN GASES,
GASEOUS AND LIQUID MIXTURES

SYNOPSIS

Part I-A: Ultrasonic velocity in gases and a vapour:

Ultrasonic velocity and absorption have been measured in a number of gases and a vapour, using a variable-path interferometer. The piezo-element was an X-cut quartz crystal having the fundamental at 188 kc/s.

A tuned-plate single valve oscillator was constructed. The observations necessary for the calculation of velocity and absorption are collected simultaneously at barometric pressure, 710 mm. of mercury approx. Except in carbon dioxide and nitrogen measurements were carried out at room temperature 25°C approx. in air, oxygen, hydrogen, freon, acetylene and ethylene chloride. In carbon dioxide and nitrogen however, measurements are taken at 35°C with a view of further measurements (Part I-B).

The velocities agree satisfactorily with the literature data. The absorption values are all relative and higher than classical values.

Part I-B: Ultrasonic velocity in gas-vapour mixtures:

The above technique was further extended in carrying out measurements in mixtures of carbon dioxide and nitrogen in ethyl alcohol, methyl alcohol, acetone, chloroform, cyclohexane,
benzene and carbon disulphide.

The measurements have been carried out at 35°C and barometric pressure 710 mm. of mercury approx. using two concentrations. At the experimental frequency (188 kc/s), carbon dioxide is practically completely dispersed, while nitrogen is not at all dispersed, thus enabling us to study the effect of the addition of the vapours on dispersion of ultrasonic velocity in gases.

Each gas or vapour has isothermal (\( Y = 1 \)), undisperse and disperse velocities. The explanation of the results consists in selecting suitable velocity combinations resulting in agreement between observed and calculated velocities.

Part II : Ultrasonic velocity in liquid binary mixtures:

Measurements on ultrasonic velocity and compressibility have been carried out in a number of liquid binary mixtures, using Hiedemann's secondary interference method with an X-cut quartz crystal having fundamental at 1.5 mc/s.

The measurements have been carried out at 25°C at different concentrations in carbon tetrachloride - cyclohexane, methylene chloride - cyclohexane, chloroform - cyclohexane, acetone - cyclohexane, dioxane - cyclohexane, ethylene dichloride - carbon tetrachloride, acetone - chloroform and chloroform - dioxane. It has been observed, that in all the cases, the
velocity deviations are negative, while the compressibility deviations are positive. This has been quantitatively explained on the basis of increase in free space after mixing the components.

In case of the last two systems, the velocity deviations are negative, although positive deviations are expected on the basis of the values of calculated and ideal free lengths. This is explained on the basis of thermodynamic excess functions and complex formation.