

Volumetric and Acoustic Properties of Phenylboronic Acid in Water at Selected Temperatures

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Boronic acids have been found to be important in a variety of biological and medical processes. Phenylboronic acid in particular is used to treat fungus bacterial infections. The literature has a lack of thermo-physical data on aqueous solutions of phenylboronic acid and water soluble derivatives. In this work, the densities and sound velocities of phenylboronic acid in water were measured as a function of temperature ranging from 288 K to 323 K (15°C to 50°C) with 5 K intervals at selected molalities using DMA 5000 M PAAR Density and Sound Meter with an uncertainty of $\pm 5 \times 10^{-6}$ g/cm³ and $\pm 5 \times 10^{-1}$ m/s. Apparent molar volumes (V_{ϕ}) and apparent molar adiabatic compressibility ($K_{\phi,s}$) were determined from the obtained experimental data. Partial molar volumes (V_m) and partial molar isentropic compressibilities ($K_{\phi,s}^0$) at infinite dilution were calculated from the corresponding data. Furthermore, the partial molar expansivity (E^0) and Hepler's constant were calculated. The parameters were interpreted in terms of solute-solvent interactions, solute-solute interactions, and structure making/breaking behavior of phenylboronic acid in water. Positive partial molar expansivity and Hepler's constant for the solutions indicate that phenylboronic acid is a structure making solute in aqueous solution.