

Compressibility of liquids. Rule of noncrossing V-P curvatures

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Abstract

Weight analysis of the liquid introduced into the stainless steel bomb under pressures up to 1 kbar in the temperature range of 20-50°C at the interval of 10°C was performed for 1,4-dioxane, acetonitrile, toluene, ethyl acetate, chlorobenzene, and n-hexane. The coefficients of the Tait equation were determined for all of the solvents at each temperature. There was a clear linear relation between the tangent bulk modulus ($1/\beta T$) at atmospheric pressure (1 bar) and the secant bulk modulus at 1 kbar; $1/\beta T = 0.9865 \times (1000 V_0/\Delta V \text{ 1kbar}) - 4559$ was found at a wide range of temperatures for different liquids, including glycerol and even mercury. This represents the rule of noncrossing P-V curvatures for the liquids. Using the correlation, it is possible to predict the coefficients (C, B) of the Tait equation from the experimental data of βT at 1 bar or, on the other hand, to calculate the value of βT from experimental compression at high pressures. © 2008 American Chemical Society.

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