Journal of Physical Chemistry B 2008 vol.112 N21, pages 6674-6682

Compressibility of liquids. Rule of noncrossing V-P curvatures

Kiselev V., Bolotov A., Satonin A., Shakirova I., Kashaeva H., Konovalov A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

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/βT) at atmospheric pressure (1 bar) and the secant bulk modulus at 1 kbar; 1/βT = 0.9865 × (1000 V0/ΔV 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.

http://dx.doi.org/10.1021/jp800513d