Physics 410/510

Experiment H-5

The Equation of State of CC4

Object:

Measure the liquid and vapor densities as functions of temperature from room temperature up to the critical temperature of the liquid, and determine the critical density. From these quantities, determine the critical pressure, using the ideal gas law, van der Waals' and some other equation of state like Wohl's and compare with the accepted value. Then, using van der Waal s'equation, determine the saturated vapor pressure of CCl4 as function of temperature, and with that information, construct a p- V diagram from your measurements, with T as parameter (V is the molar volume, i.e. volume/mass). Indicate on the diagram the molar volumes that you used in the two tubes for the experiment, and describe qualitatively the different behavior of the liquid in both tubes.

NOTE: This experiment offers an excellent opportunity for you to familiarize yourself with the vast amount of information on scientific data contained in the Landolt-Bomstein collection (hint: what you can use here is contained in the 6th Ed. (1971), Vo. II, Part 1, p. 298).

From the office file, procure information on the mass of liquid in each tube, the tube diameter, etc. The thermocouples are chromelalumel. The experiment is to be performed by the method of Cork referred to below. Two tubes of liquid used, are held in a metal frame to which are fastened the two thermocouples, one near the top, one near the bottom.

References (*means: copies in instruction book): * Cork, R,S,I. 1,p.563, 1930

* W.J. Moore, Physical Chemistry, 4th ed, Prentice Hall (1972) * Sengers, J.V., and A.L. Sengers, C&EN, June 1968, p.104

* J. Timmennans, Physics -Chemical Constants of Pure Organic Compounds, Elsevier Publishing, 1950.

* Washburn, Principles of Physical Chemisty, p. 74 (2nd Ed.)

* Nernst, Theoretical Chemistry, p. 72 also pp. 240-50 (5th Ed.)

Landolt -Bornstein, Numerical Data and Functional Relationships in Science and Technology, Springer Verlag, on Reserve in Clark Library (ask the librarian)

R.O. Pohl, 1994