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CALCULATION OF
HIGH-PRESSURE
VAPOR-LIQUID
EQUILIBRIA

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Reprinted from

Industrial and Engineering Chemistry

March 1968, Pages 34-52

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Although it has been common practice for many years to subject vapor-liquid equilibrium data to thermodynamic analysis, in the past this practice has been largely confined to systems at low or moderate pressures. While many experimental studies of high-pressure vapor-liquid equilibria have been published, little work has been reported on the reduction of such data to thermodynamic functions. However, such reduction is necessary for interpreting and correlating experimental data; thermodynamic analysis is the essential tool whereby experimental data can be generalized to enable prediction of phase behavior under conditions different from those at which the data were obtained. This tool is particularly useful for engineering work where it is often necessary to predict from binary data the behavior of a system containing more than two components.

In this work, we discuss thermodynamic analysis of vapor-liquid equilibria at high pressures, including the critical region. We restrict attention to systems containing nonpolar (or slightly polar) fluids such as those encountered in the petroleum and related industries. In particular, we present equations for reducing raw binary data to thermodynamically significant binary parameters; upon generalizing these equations to systems containing any number of components, we then predict phase behavior of multicomponent mixtures without introducing any ternary (or higher) parameters.

APPLIED THERMODYNAMICS SYMPOSIUM

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Fugacity coefficients, activity coefficients, and liquid partial molar volumes are the keys to the thermodynamic development of these equilibrium calculations

