

CHAPTER I

INTRODUCTION



1.1 Equation of state

Equations of state (EOS) are used to describe phase equilibrium, calculate physical properties such as pressure and molar volume of substances at different temperatures, and predict thermodynamic properties such as specific heat, isothermal compressibility, and enthalpy. EOSs based only on pure fluids and binary mixtures are very valuable tools in predicting the complex behavior of multicomponent mixtures.

These equations are widely used to predict phase equilibrium in the chemical and petroleum industries and also in process design. Various equations of state predict these properties with different degrees of accuracy and require different amounts of resources for proper application.

1.2 Generalized Quartic equation of state

Vinod and Bienkowski (1994) have developed a generalized four-parameter quartic equation of state (EOS) for nonpolar and polar fluids. To use the new generalized quartic EOS for polar fluids, only four characteristic properties of the pure compound are required - critical temperature, critical volume, acentric factor, and dipole moment. Quartic equation of state is improved accuracy by using a form of the repulsive term with better accuracy than the van der Waals form, which leads to an equation of state that can be solved efficiently and has roots that can be unequivocally identified and its superior performance for nonpolar fluids is retained. The accuracy of this equation of state for predicting thermodynamic properties of pure polar compounds, including vapor pressure, density, residual enthalpy, enthalpy of vaporization, and second virial coefficient is very good. This study is required in order to show how accurate the Quartic EOS can be used to describe the behavior of multicomponent mixtures.

1.3 The Objective of this work

The principle aim of this study is to test the capabilities of Quartic equation of state for describing binary mixture properties. The proper expressions for the properties of binary mixtures is developed based on proper mixing rules and is tested with experimental data.

1.4 The Scope of the work

- a) Search and Collect the experimental data of binary mixtures (PVT data)
- b) Use the proper mixing rule to apply to Quartic equation of state and determine the values of interaction parameters.
- c) Derive the equations of the important thermodynamic properties based on Quartic equation of state
- d) Write and compile computer program with a Turbo Pascal compiler for convenience of calculation
- e) Compare the calculation data with experimental data

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