Summary

E. Experimental Techniques of Vapour-Liquid Equilibrium Apparatus

(1) Non-circulatory Differential Type

(2) Recirculatory Type .

(a) Condensate liquid return

(b) Condensate vapour return

Chapter 2. Apparatus

The simple differential distillation type still and the new recirculatory equilibrium still designed are described. Their operating procedures are discussed.

Nomenclature.

All necessary nomenclature is given.

Physical Properties of the Liquids Used.

The densities and refractive indices at 30°C, boiling points at atmospheric pressure, latent heats of vaporization at normal boiling point, critical properties and dipole moments of all the pure liquids used are given in tabular forms. All these properties have been used.

Chapter 3. Methylcyclohexane - Toluene System.

This system was used to calibrate the simple differential distillation type still since reliable equilibrium data are available in literature. This system is often used to calibrate distillation towers. The experimental equilibrium data are tested for thermodynamic consistency and are correlated.

This system does not form azeotrope. The new proposed method also does not predict azeotrope for this system.

Chapter 4. Benzene - Cumene System

This system has got technical importance as Cumene is manufactured by alkylation of benzene with propylene. Vapour-liquid equilibrium data have been obtained experimentally for the first time. The data are test-ed for thermodynamic consistency and are correlated.

This system does not form azeotrope. The new proposed method also does not predict azeotrope for this system.

Chapter 5. Isoamyl alcohol - Cumene System

The difference in boiling points of the pure components of this system is not high but dissimilarity in their chemical structure is marked. The system thus has thermodynamic importance. Equilibrium data are determined experimentally for the first time. The data are tested for thermodynamic consistency and are correlated.

Theoretical methods predict azeotrope for this system. This is supported by experimental observation.

Chapter 6. Methanol - Methylcyclohexane System [Partially miscible

This system is of extreme non-ideality with wide boiling range and hence it has got thermodynamic importance. The equilirbium data experimentally

determined using the simple differential distillation type still and the new recirculatory equilibrium still designed, are presented for the first time. The data are checked for thermodynamic consistency and are correlated.

The theoretical methods predict azeotrope for this system. This is supported by experimental observation.

Chapter 7. Methanol - Toluene System

This system has got both technical and theoretical importance. A lower alcohol like methanol is often used to separate aromatic hydrocarbon mixtures having low relative volatility and close boiling range. The non-ideality is high and the difference in boiling points of the components is large.

The experimentally obtained equilibrium data are compared with the literature data. The data are tested for thermodynamic consistency and are correlated.

Theoretical methods predict azeotrope which is substantiated by experimental investigation.

Chapter 8. Methanol - Methylcyclohexane - Toluene System

The equilibrium data have been obtained for the first time. The data are tested for thermodynamic consistency and are correlated.

This system forms azeotrope.

Appendices :

I. Explanation of newly proposed Method for the Prediction of Binary and Ternary Azeotropes.

A rigorous method using Dalingart and Davis equation for vapour pressure of the pure components of the system, Chao's modified Redlich-Kister correlating equations for the binary systems and Lu's point by point thermodynamic consistency tests for binary systems, is proposed for the accurate prediction of binary azeotropes. This method is extended to ternary systems.

II. Explanation of Extended Reed's Method for the Prediction of Binary Azeotropes.

The original Reed's method is extended to polar-non-polar systems by taking into account the orientation contribution to internal pressure.

III. Explanation of Yoshimoto's condition for Binary Azeotropic Formation.

Yoshimoto's condition for binary azeotropic formation is explained.

IV. Explanation of Malesinski's Method for the Prediction of Binary Azeotropes.

The method is explained.