Measurement and Correlation of Vapor-Liquid Equilibria of Some Binary Mixtures Containing 1, 4–Dioxane

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Accurate Vapor-Liquid Equilibrium (VLE) data are needed for the design of separation equipment such as distillation columns. 1, 4-dioxane, is frequently used as solvent in chemical industry because of its unique physicochemical nature. It has two cyclic groups separated by two methylene groups. In this paper, new experimental data consisting of 14 sets of PTxy data and 11 sets of PTx data, for nine binary mixtures of 1,4-dioxane with two aliphatic hydrocarbons and seven alcohols are presented. The details of the systems are given in Tables 1a. & 1b. The experimental method for the determination of PTxy and PTx data are described in detail. The measured data provide liquid activity coefficients for model correlation in order to predict VLE of multicomponent mixtures from the constituent binary model parameters. Moreover, these data are quite useful in testing the capability of group contribution models.

Table 1a: Systems for which PTxy data are measured

System	Temperature in K
1-Heptane (1)-1,4-Dioxane (2)	333.15, 363.15
1,4-Dioxane (1)-1-Octane (2)	333.15, 368.15
Ethanol (1) – 1,4-Dioxane (2)	328.15, 338.15, 348.15
2-Propanol (1)-1,4-Dioxane (2)	348.15
1-Propanol (1)-1,4-Dioxane (2)	358.15
2-Butanol (1)-1,4-Dioxane (2)	343.15, 363.15
1,4-Dioxane (1)-2-Methyl-1-Propanol (2)	358.15
1,4-Dioxane (1)-1-Butanol (2)	353.15, 363.15

Table 1b: Systems for which PTx data are measured

System	Temperature in K
2-Methyl-2-Propanol (1)-1,4-Dioxane (2)	323.15 K, 333.15 K, 343.15 K, 353.15 K; 26.55 kPa, 53.32 kPa, 79.97 kPa, 101.3 kPa
1,4-Dioxane (1)-2-Methyl-1-Propanol (2)	333.15 K, 368.15 K, 353.15 K

Thermodynamic consistency of each of the 14 sets of PTxy data is checked by the method of Fredenslund et.al. The data are correlated by using the five popular activity coefficient models, Margules, Van Laar, Wilson, NRTL and UNIQUAC.