

## Measurements of Isothermal Vapor-Liquid Equilibria and the Development of a Predictive Equation for the Ternary System of Ethanol + N-Butanol+ Water

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Isothermal vapor-liquid equilibrium data for the ternary system of (1)ethanol + (2)n-butanol + (3)water were measured by a static method. The newly developed measurement facility for isothermal VLE of binary and ternary mixtures is introduced. Since almost all of its components are standardized products of JIS or ISO, the production cost was reduced. The construction of the apparatus is the same as Rarey and Gmehling's apparatus. The apparatus consists of two syringe pumps with a thermocouple and a pressure transducer, thermostatic bath with a resistance temperature sensor, and an equilibrium cell with two needle valves, stiller and a pressure transducer. The handmade syringe pumps and the equilibrium cell are mainly composed of standardized products in order to decrease the production cost. Isothermal VLE data for (1)ethanol + (2)n-butanol + (3)water ternary mixture were obtained. We compared our binary data with literature data to confirm the repeatability and the reliability of the measurements. The azeotropic pressure data of (1)ethanol + (2)water binary mixture are lower than those in literature. Other data agreed with literature data. Experimental data were correlated by the volume translated Peng-Robinson equation of state (VTPR EOS). Despite using the same algorithm, the VTPR EOS can describe the liquid density of the binary and the ternary systems better than the Peng-Robinson EOS.