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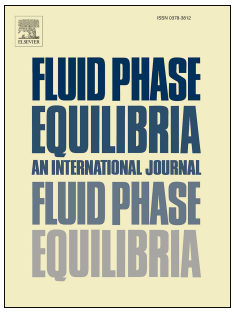

Heterogeneous azeotropic distillation for the separation of n-propanol + water mixture using n-propyl acetate as entrainer

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Heterogeneous Azeotropic Distillation for the Separation of n-Propanol + Water Mixture using n-Propyl Acetate as Entrainer

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Abstract

Heterogeneous azeotropic distillation is a widely used process in the chemical process industries for the separation of binary azeotropic mixtures into their constituent pure components. It involves the addition of an entrainer which is partially miscible and forms a heterogeneous azeotrope preferably with one of the original components. For the design of heterogeneous azeotropic distillation columns, a detailed study of the heterogeneous region is crucial and this requires experimental vapor-liquid-liquid equilibrium (VLLE) data. The present study focuses on the study of n-propyl acetate as entrainer to effect the separation of industrially available azeotropic mixture n-propanol-water. A new and simple still was constructed to measure the VLLE data for the ternary system. The isobaric VLE data for the two binary systems n-propanol - water and n-propanol - n-propyl acetate and isobaric VLLE data for the ternary system n-propanol - water - n-propyl acetate were measured at atmospheric pressure. The experimental results have been compared with various thermodynamic models such as NRTL, UNIQUAC, UNIFAC (VLE) and UNIFAC (LLE). The set of parameters obtained from the above models has been used to construct the residue curve map (RCM) for the ternary system and the effect of n-propyl acetate to accomplish the separation of the azeotropic mixture has been discussed.

Keywords: Vapor-liquid-liquid equilibrium, ultrasonic homogenizer, NRTL, UNIQUAC, UNIFAC, residue curve map

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