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Development of a predictive Dimensionless Distribution coefficient (pDD) model for fractionation of Hops extracts

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Abstract (less than 300 words)

Measurements of vapor-liquid distribution coefficients (K-values) of compounds contained in hops-extract ethanol or ethanol aqueous solution in high pressure CO_2 systems were carried out at temperatures of 313–373 K and pressures of 5–14 MPa with a continuous counter-current fractionation apparatus. Using the measured K-value data, a correlation for the vapor-liquid distribution coefficients of 7 solutes in hops-extract was constructed based on entropy-based solubility parameter (eSP)[1]. The correlation was generalized as a dimensionless form, named as predictive Dimensionless Distribution coefficient (pDD) model, by modifying the equation developed in the previous work[2] with keeping eSP concept and by introducing new mathematical approaches. From this eSP concept, eSP distance of solute and fluid (vapor or liquid) is considered as a key factor to predict K-values of solutes. In the calculation with the pDD model, it was assumed that mutual interaction of solutes was neglected due to the dilute solution.

The pDD model was then applied to the counter-current extraction simulation, which shows that flavor compounds can be highly fractionated and selectivities can be advantageously manipulated with temperature and pressure. Resin components were found to concentrate in the raffinate phase. From these results, highly effective separation of hops-extract can be consistently demonstrated in the experimental system and in the predictive simulations.

Reference

[1] M. Ota et al., Fluid Phase Equilibria, 425 (2001) 65- 71.

[2] M. Ota et al., Fluid Phase Equilibria, 434, (2017) 44-48.

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