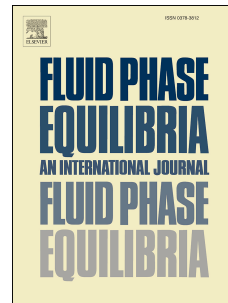


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Ternary phase behavior of phenol + toluene + zwitterionic alkaloids for separating phenols from oil mixtures via forming deep eutectic solvents

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ABSTRACT: Phenols are important materials for the organic chemical industry. They mainly come from coal liquefaction oil, coal tar, petroleum and biomass pyrolysis oil, making the separation of phenols from oil mixtures of great commercial value. Two zwitterionic alkaloids, betaine and L-carnitine, biodegradable and environmentally benign ionic compounds, can efficiently separate phenols from oils by forming deep eutectic solvents (DESs). In this work, the phase equilibria of two ternary systems of toluene + phenol + betaine and toluene + phenol + L-carnitine were measured at 25.0 °C, 45.0 °C and 65.0 °C under atmospheric pressure. The phase behaviors of the two ternary systems were studied, which indicates that there are three kinds of phase regions: liquid, liquid-liquid, and liquid-liquid-solid. The separation of phenol from oil mixtures occurs at the latter two phase regions. Effects of temperature, zwitterionic alkaloid type and its dosage on the phase equilibrium were investigated. With decreasing temperature, the distribution and selectivity coefficients increase. L-carnitine shows better performance in separating phenol from oils via forming DES than betaine.

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