

Effect of Cosolvent on Cloud-Point of Binary and Ternary Systems for the Poly(4-chlorostyrene) + Cosolvent Mixtures in Supercritical Fluid Solvents

Dong-Sun Yang^S, Soon-Do Yoon and Hun-Soo Byun^C

*Chonnam National University, School of Biotechnology & Chemical Engineering, Yeosu, Jeonnam, Korea
hsbyun@chonnam.ac.kr*

High pressure phase behavior experiment for the binary and ternary mixture of the Poly(4-chlorostyrene) [P(4-CS); $M_w = 90,000$, $M_n = 38,000$, $PD = 2.37$] + supercritical solvents + cosolvent systems are reported of cloud-point data at a temperature range (332.8 ~ 494. 2) K and pressure up to about 260.0 MPa. P(4-CS) + CO₂ + dimethyl ether (DME) and P(4-CS) + DME + 4-chlorostyrene(4-CS) and P(4-CS) + 4-CS, acetone and ethanol in supercritical propane, propylene, n-butane and 1-butene were performed in order to obtain of cloud-point data for each system. The P(4-CS) + 1-butene, propylene and propane + acetone systems are shown in changes of the pressure-temperature (P-T) curve from upper critical solution temperature (UCST) region to lower critical solution temperature (LCST) region as acetone concentration increases. Also the phase behavior pressure for the P(4-CS) + CO₂ + 0.0 wt.%, 5.3 wt.%, 18.3 wt.% and 32.3 wt.% DME systems are rapidly decreased as DME concentration increase. The cloud-point curves for P(4-CS) + n-butane and 1-butene + ethanol and P(4-CS) + n-butane and 1-butene + 4-CS systems exhibit USCT-type curves and the phase behavior curves for the P(4-CS) + DME + 0.0 wt.%, 14.4 wt.%, 29.3 wt.% and 40.7 wt.% 4-CS systems exhibit LCST-type phase behavior with a positive slope. Pressure-composition (P - x) isotherms are obtained for the CO₂ + 4-CS systems using static apparatus at a five temperature (313.2, 333.2, 353.2, 373.2 and 393.2) K and pressure up to 23.83 MPa. The CO₂ + 4-CS system exhibits type-I phase behavior with continuous mixture critical curve and is modeled with the Peng-Robinson equation of state using two adjustable parameters.