

Title: On the Solubility of Three Disperse Anthraquinone Dyes in Supercritical Carbon Dioxide: New Experimental Data and Correlation

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Abstract: Solubility measurements of quinizarin. (1,4-dihydroxyanthraquinone), disperse red 9 (1-(methylamino) anthraquinone), and disperse blue 14 (1,4-bis(methylamino)anthraquinone) in supercritical carbon dioxide (SC CO₂) were carried out in a flow type apparatus, at a temperature range from (333.2 to 393.2) K and at pressures from (12.0 to 40.0) MPa. Mole fraction solubility of the three dyes decreases in the order quinizarin (2.9×10^{-6} to $2.9 \cdot 10^{-4}$), red 9 (1.4×10^{-6} to 3.2×10^{-4}), and blue 14 (7.8×10^{-8} to 2.2×10^{-5}). Four semiempirical density based models were used to correlate the solubility of the dyes in the SC CO₂. From the correlation results, the total heat of reaction, heat of vaporization plus the heat of solvation of the solute, were calculated and compared with the results presented in the literature. The solubilities of the three dyes were correlated also applying the Soave-Redlich-Kwong cubic equation of state (SRK CEoS) with classical mixing rules, and the physical properties required for the modeling were estimated and reported.

KeyWords Plus: Equation-of-State; Azo Dyes; Solids; Fluids; Derivatives; Prediction; Liquids; Density; MPA

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