

High-Pressure Phase Behavior of Binary and Ternary Mixtures Containing Ionic Liquid [Cn-mim][Tf2N], Dimethyl Carbonate and Carbon Dioxide

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High-pressure phase equilibrium data for binary and ternary mixtures consisting of a room temperature ionic liquid, dimethyl carbonate (DMC) and carbon dioxide (CO_2) were measured using an equilibrium apparatus equipped with a variable-volume view cell. The ionic liquid studied in this work is 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide [C6-mim][Tf2N]. For the binary system of CO_2 + DMC, the bubble point pressures were measured at various CO_2 compositions and at temperatures from room temperature to about 343.15 K. The experimental bubble point pressure data were correlated with the Peng-Robinson equation of state to estimate the corresponding dew point compositions at equilibrium with the bubble point compositions. For the binary system of CO_2 + [C6-mim][Tf2N], the solubilities of CO_2 in [C6-mim][Tf2N] were determined by measuring the bubble point pressures of the binary mixtures of various compositions at temperatures between 303.85 K and 344.55 K. The equilibrium pressure increased very steeply at high CO_2 compositions. The experimental data for the CO_2 + [C6-mim][Tf2N] system were also correlated using the Peng-Robinson equation of state. Finally, the effect of IL on the vapor-liquid equilibrium behavior of the CO_2 + DMC system was investigated by measuring the bubble point pressures of the ternary mixtures of CO_2 + DMC + [C6-mim][Tf2N] with various compositions at temperatures between 303.15 K and 343.15 K. The solubility of CO_2 in the DMC + [C6-mim][Tf2N] mixture decreased as the ionic liquid content in the mixture increased. The phase boundaries of vapor-liquid equilibria for the ternary mixtures of CO_2 + DMC + [C6-mim][Tf2N] were shown in ternary plots at several temperatures and pressures.