

### High-Pressure Phase Behavior of CO<sub>2</sub> + 1-Ethyl-3-methylimidazolium Chloride System

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The phase behavior of carbon dioxide (CO<sub>2</sub>) and the ionic liquid 1-ethyl-3-methylimidazolium chloride ([emim][Cl]) was measured and correlated at high pressures up to ~70 MPa and at temperatures between 353.15 K and 373.15 K. The solubility data of CO<sub>2</sub> in [emim][Cl] were obtained by observing the bubble point pressure at specific temperatures. A variable-volume view cell, which is a high-pressure equilibrium apparatus, was used to measure the CO<sub>2</sub> + [emim][Cl] system solubility under varying pressure and temperature conditions. The resulting data showed that carbon dioxide dissolved well in the ionic liquid at low carbon dioxide concentrations, but carbon dioxide solubility dramatically decreased as the mole fraction of carbon dioxide was increased. The experimental data were well fitted by the Peng-Robinson equation of state with a quadratic mixing rule and cubic parameters estimated by the Joback method.