Ionic Liquids as CO_2 Capture Media

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Carbon dioxide capture and sequestration is one strategy for reducing the amount of CO_2 gas released by processes utilizing fossil fuels currently being pursued. The current capture technology involves absorbing the gas into an aqueous amine solution. This process suffers from a number of problems, including a large energy penalty for regeneration of the absorbent. Ionic liquids are being investigated as replacement solvents for such gas separation applications, because they are non-volatile, generally non-corrosive, and their absorption strength can be tuned. We have measured the solubility of CO_2 using both gravimetric and volumetric techniques in a variety of pure ionic liquids. The incorporation of fluoroalkyl groups, ethers, sulfate, and carbonyl moieties on the cation and anion were investigated in order to better understand the structural requirements for maximizing physical absorption of the gas. Ionic liquids capable of chemical complexing CO_2 were also explored. We will present results that show how careful design of the ionic liquid can lead to an optimal combination of both physical absorption and weak chemical complexation, resulting in high carbon dioxide solubilities and reasonable desorption conditions.