To be filled by organisers

CO2 absorption in ionic liquids under high-pressure conditions

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Ionic liquids (ILs) are salts, of which the melting temperatures are at or below ambient temperature. They have some unique characteristics such as non-volatility, non-flammability, high electrical conductivity, miscibility with various chemicals, and so on. Furthermore, CO2 is dissolved well in some kinds of ILs, while ILs are not evaporated at all in the CO2 phase even under the high-pressure conditions. These favorable characters can overcome some drawbacks of the current CO2 absorbents, flammability and volatility of absorbents, and high energy-consumption during absorption and/or desorption. Since the first report on the phase behavior of the IL + CO2 system [1], CO2 absorption in ILs has been well-investigated at various temperatures and pressures to develop better IL absorbents and design CO2 capture processes using ILs. However, the mole fraction scaled solubilities and the Henry constatns were only reported in many cases. They are measures of the CO2 absorption properties in ILs, but the molecular volumes/weights of ILs are not taken into consideration. More important information for the engineering design in the CO2 separation is the CO2 capacity, i.e. the molarity or molality scaled solubilities of CO2. A very limited information is available for the effect of chemical modifications on the CO2 capacities in ILs. Our research group have investigated pressure–volume–temperature–composition (*pVTx*) relations for IL + CO2 mixtures to obtain both the mole fraction and molarity scaled solubilities [2]. For example, we demonstrated that the ether group on the ammonium enhanced the molarity of CO2 through the interaction between the cation and CO2. Here, we summarize our earlier and recent studies on the CO2 absorption behaviors in the physical and chemical IL absorbents under high pressure conditions. For the physical absorbents, the cations were imidazoliums, phosphoniums, ammoniums, and amidiniums, and the anions were amides, borates, sulfates, and sulfonates. The chemical absorbents were the carboxylate and amino acid salts with the dialkylimidazolium and tetraalkylphosphonium cations. We discuss the effect of chemical modifications on the CO2 physisorptions and chemisorptions based on the *pVTx* relations and the derived thermodynamic parameters of solution.

**References**

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