

## Inhibition of CO<sub>2</sub> Hydrate by Piperidinium Ionic Liquids

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The phase equilibrium conditions of CO<sub>2</sub> hydrates were examined in the presence of morpholinium and piperidinium ionic liquids (ILs) with a mass fraction of 0.1. The equilibrium conditions were in the ranges of (274.6 to 281.2) K and (1.80 to 3.95) MPa. The addition of ILs shifted the hydrate equilibrium conditions to a higher pressure and lower temperature region compared to the hydrate formed from pure water. Piperidinium and morpholinium ILs showed similar inhibition effects in the higher temperature range  $\geq 278.5$  K, whereas at lower temperature piperidinium ILs had a slightly better inhibition effect than morpholinium ILs. The anionic species also affected the hydrate inhibition effectiveness. Smaller anions, i.e., Br<sup>-</sup>, had a slightly better inhibition effect than the bigger ions of BF<sub>4</sub><sup>-</sup>

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