

The Inhibition Effects of Ionic Liquids on Carbon Dioxide Hydrate Formation

신병수, 김기섭¹, 강정원*
고려대학교; ¹한국교통대학교
(jwkang@korea.ac.kr*)

An ionic liquid can be used as an inhibitor to prevent gas hydrate formation. Compared with existing inhibitors (methanol, ethylene glycol and etc.), ionic liquids may be used in relatively small amount and have broad spectrum of inhibition capability due to different combinations of cations and anions. In this study, the inhibition effect of newly-designed and synthesized ionic liquids composed of hydroxyethyl-methylpyrrolidinium was compared with existing butyl-imidazolium based ionic liquids in carbon dioxide-water hydrate system. The thermodynamic inhibition effects of ionic liquids were compared by hydrate - aqueous liquid - liquid carbon dioxide equilibria. The inhibition effects of ionic liquids on formation of carbon dioxide hydrate were qualitatively related with electrostatic solubility parameters calculated using COMPASS Force field molecular simulation. The differences of solubility parameters with water can be used to compare the degree of inhibition. Also, the kinetic inhibition effects of selected ionic liquids were compared experimentally. The observation in this study can be used to design effective ionic liquids for inhibition of carbon dioxide hydrate formation.