Kinetic investigation of methane hydrate in the presence of Imidazolium Based Ionic Liquid solutions

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Abstract

Methane hydrate formation experiments in the presence of the various imidazolilium based ionic liquid solutions with 0.5wt% concentration including 1-buthyl-3-methylimidazolium methyl sulfate ([BMIM][$MeSO_4$]) , 1-ethyl-3-methylimidazolium hydrogen sulfate ([EMIM][HSO_4]), 1-ethyl-3-methylimidazolium ethyl sulfate ([EMIM][$EtSO_4$]), 1-butyl-3-methylimidazolium tetrafluoroborate ([BMIM][BF_4]) and 1-(2-hydroxyethyl)-3-methylimidazolium tetrafluoroborate ([OH-EMIM][BF_4]) were conducted in a high pressure reactor at the same temperature. The induction time, gas consumption and temperature were measured.The results of experiments were indicated that [EMIM][$EtSO_4$] and [BMIM][$MeSO_4$] had the kinetic inhibiton effects meanwhile the other ionic liquids could be able to apply as the kinetic promoters.

Keywords: ionic liquid, hydrate, methane, imidazolium, kinetic, promoter, induction time.

Research Highlights

- Measuring induction time, gas consumption and temperature.
- [EMIM][$EtSO_4$]and [BMIM][$MeSO_4$] solutions with 0.5w% had the kinetic inhibiton effects.
- [EMIM][HSO_4], [BMIM][BF_4] and [OH-EMIM][BF_4] solutions with 0.5w% could be as the kinetic promoters for methane hydrate formation.