Clathrate equilibrium data for CO_2+N_2 mixtures with TBAB, TBAF, CP, TBAB+CP, TBAF+CP promoters

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Abstract

Carbon Dioxide capture and sequestration (CCS) is nowadays an important area of research for alleviating CO_2 emissions worldwide. According to [1], CO_2 is globally the largest pollutant to which the global warming is attributed. Consequently, hydrates can become of great importance as they form the basis for a new technology that concerns CO_2 capture from flue gases (hydrate crystallization). In this work hydrate equilibrium data measured at the Centre Thermodynamic of Processes in MINES ParisTech (France) are presented as part of a collaborative project funded by the Danish Technical Research Council. More particularly, in this study experimental results for hydrate dissociation with several promoters are presented. The isochoric method is used to determine the gas hydrate dissociation points. Different CO_2+N_2 gas mixtures were used with presence of promoters such as tetra-butylammonium bromide (TBAB), tetra-butylammonium fluoride (TBAF), cyclopentane (CP) and mixtures of TBAB and TBAF with CP. The combination of TBA halides with CP was inspired by [2] as it came out synergetic effect that enhances promotion between TBAB (5% w/w) and CP (5% v/v). The results have shown synergetic effect for 20% w/w TBAB+CP (5% v/v) and partly (>30 bar) for 5% w/w TBAF+CP (5% v/v). Concerning experiments with pure promoter, there is excellent consistency between our results and literature for different gas mixtures and promoter concentrations. Moreover, they exhibit very good agreement with existing literature.

Finally, experimental uncertainties for temperature, pressure, and molar composition are also presented.

Reference

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