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INSIGHTS INTO CO2 CAPTURE BY FLUE GAS HYDRATE FORMATION USING SELECTED AMINO ACIDS AND SURFACTANT

CHEMISTRY FOR THE ENVIRONMENT
3. Carbon Dioxide Capture, Storage, and Recycling
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Abstract

The primary objective is to investigate the induction time, rate of hydrate formation and CO2 separation efficiency during hydrate formation from Flue gas (CO2+N2) in the presence of selected amino acids & sodium dodecyl sulfate using rocking cell apparatus. Hydrate based process could provide an innovative solution to capture CO2. Among all surfactants, SDS is found to be most effective CO2 hydrate promoter both individual and along with other promoters [4]. Recently certain amino acids l-valine & l-methionine with positive hydrophobicity are found to enhance CO2 hydrate growth kinetics and are considered as a potential candidate for CO2 capture from flue gas as amino acids are environment-friendly chemicals. However, gas hydrate based CO2 capture using amino acids is in an early stage of development. A further investigation is carried out in this research work.

In this study, we have analyzed hydrate formation and CO2 capture ability of 3 hydrate promoters using flue gas (CO2 (20%) +N2). The study of important parameters such as induction time, the rate of hydrate formation, CO2 separation efficiency in the presence of sodium dodecyl sulfate (SDS) and selected amino acids, l-valine and l-methionine using a rocking cell is conducted. 10 mL solution is prepared with the 3000-ppm concentration of respective hydrate promoter, and Isothermal experiments are performed at constant temperature (3℃/1℃) and Initial pressure of 90, 120 bars to investigate the parameters. Flue gas with 20% mole fraction CO2 is used during the experiment. Recommendation for an active promoter for CO2 capture through flue gas hydrate formation can be based on a short induction time, high gas consumption and high separate factor, which are under investigation in this work. Initial experimental results suggest that L-met is more effective hydrate promoter and show rapid hydrate growth compare to L Valine during the flue gas hydrate formation this could be due to the difference in their hydrophobicity. SDS is most effective among all hydrate promoter for flue gas tested in this study. Increase in pressure leads to increasing growth rate and reduction in induction time due to the higher driving force. Gas chromatography analysis at the end of the isothermal experiment show SDS is most efficient for CO2 capture from flue gas and highest separation efficiency among all three promoters.

Keyword 1
Gas hydrate
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CO2 Capture
Keyword 3
Flue gas hydrate
Keyword 4
Rocking Cell