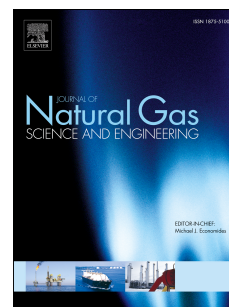


Accepted Manuscript

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Pinnelli S.R. Prasad, Burla Sai Kiran



PII: S1875-5100(18)30065-9

DOI: [10.1016/j.jngse.2018.02.001](https://doi.org/10.1016/j.jngse.2018.02.001)

Reference: JNGSE 2452

To appear in: *Journal of Natural Gas Science and Engineering*

Received Date: 5 December 2017

Revised Date: 29 January 2018

Accepted Date: 1 February 2018

Please cite this article as: Prasad, P.S.R., Kiran, B.S., Are the amino acids thermodynamic inhibitors or kinetic promoters for carbon dioxide hydrates?, *Journal of Natural Gas Science & Engineering* (2018), doi: 10.1016/j.jngse.2018.02.001.

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Are the amino acids thermodynamic inhibitors or kinetic promoters for carbon dioxide hydrates?

Pinnelli S.R. Prasad^{*, 1} and Burla Sai Kiran¹

¹ Gas Hydrate Division, CSIR–National Geophysical Research Institute (CSIR–NGRI),
HYDERABAD – 500 007 (India)

Corresponding author's e-mail: psrprasad@ngri.res.in; Phone: +91 40 2701 2710;

Fax: +91 40 2717 1564

Abstract:

This study deals with the carbon dioxide (CO₂) hydrate formation in aqueous solutions, containing 0.5 wt% amino acids (L-valine, L-phenylalanine, L-cysteine, L-methionine and L-threonine) under isochoric conditions. Systematic experiments were conducted in both stirred (300 rpm) and non-stirred configurations. The hydrate formation requires higher sub-cooling than the pure CO₂ system. The gas uptake in the hydrates, formed under stirred conditions, in l-val, l-cys and l-met systems is ~20% higher than the pure system, while in other two (l-phe & l-thr) it is comparable to the pure system. Further, there is no appreciable gas uptake in pure, l-phe and l-thr systems under non-stirred conditions. On the other hand, the gas uptake is higher and faster, similar to stirred conditions, in other three systems, i.e., l-val, l-cys and l-met. Thus, the aqueous solutions consisting of these three amino acids are useful in the CO₂ gas capture and storage applications.

Keywords: Carbon dioxide hydrates, amino acids, thermodynamic inhibitor, kinetic promoter, Raman Spectroscopy.

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