

Accepted Manuscript

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PII: S1875-5100(16)30404-8

DOI: [10.1016/j.jngse.2016.06.021](https://doi.org/10.1016/j.jngse.2016.06.021)

Reference: JNGSE 1568

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

Received Date: 10 February 2016

Revised Date: 19 May 2016

Accepted Date: 7 June 2016

Please cite this article as: Tumba, K., Mohammadi, A.H., Naidoo, P., Ramjugernath, D., Assessing hydrate formation as a separation process for mixtures of close-boiling point compounds: A modeling study, *Journal of Natural Gas Science & Engineering* (2016), doi: 10.1016/j.jngse.2016.06.021.

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Assessing hydrate formation as a separation process for mixtures of close-boiling point compounds: A modeling study

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Abstract

This study was aimed at developing a simple modeling tool for assessing gas hydrate formation as a means to separate gas mixtures. In order to assess the feasibility of this technology for separation, phase equilibrium data obtained via experimental and modeling studies are required for the design and optimization of processes based on gas hydrate formation. Three selected gas mixtures (ethane + ethene, ethyne + propene, and ethyne + propane) under hydrate formation conditions were examined. This was done on the basis of pressure-composition plots obtained with the newly developed multi-phase-multi-component model. The procedure, based on the equality of fugacity and material balances, is presented for predicting compositions in coexisting phases for multi-component systems under hydrate stability conditions. The new multi-phase-multi-component model is simple and has been successfully validated against independent data, as well as experimental data obtained by our group.

Keywords: Gas hydrates; separation; phase equilibria; modelling; close-boiling; multi-phase.

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