



Hydrate Based Gas Separation Technology in Low Dose of Porous Media

N.Gholipour Zanjani¹, A.Zarringhalam Moghaddam^{*2}, K. Nazari³,
M. Mohammad Taheri²

¹ Petrochemical Engineering Department, Faculty of Chemistry and Petrochemical Engineering, Standard Research Institute P.O.B 31745-139, Karaj, Iran

² Chemical Engineering Department, Tarbiat Modares University, Tehran, Iran, Tehran, Iran. Tel./fax: +98 21 88005040

³ Chemistry and Petrochemical Research Division, Research Institute of Petroleum Industry, Tehran, Iran

*Corresponding Author's E-mail: zarrin@modares.ac.ir

Abstract

This paper studied the gas separation and purification utilizing hydrate based gas separation (HBGS). The effect of nano porous media in split fractionation and the influencing of the composition of the feed gas were considered. Gas hydrate formation of ternary $\text{CH}_4/\text{C}_2\text{H}_6/\text{C}_3\text{H}_8$ mixture were carried out in the fixed amount of water in the presence of nanostructure silica based material with the mass ratio of 5%. In this way, three different gas compositions were used as initial feed. After hydrate formation, the gas phase in equilibrium with the hydrate was used as a new feed for the next step of hydrate formation.

The presence of porous media improved selectivity in methane purification. The continuous stepwise HBGS showed a good efficiency in selective gas separation. The change in the concentration of methane is significant specially when the amount of methane in the gas feeds are lower. Such an effect brought about by low dose of porous material can be utilized in the methane purification by HBGS.

HWHYD software was applied to predict the equilibrium condition. Comparison of the equilibrium conditions in bulk system show the transfer of hydrate equilibrium curve to higher pressure and lower temperature due to the change in gas composition.

Keywords: Nano Porous media, Gas separation, Hydrate.

Research Highlights

- The gas separation using HBGS is sensitive to the feed gas composition.
- Two step continuous hydrate formation increases considerably methane purification in gas phase.
- The H-L-V phase equilibria curve transfer to higher pressure in sequence hydrate formation of gas mixtures.