



Impressive Effect of Poly (Ethylene Oxide) on Enhancing Methane Hydrate Storage Capacity

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Abstract

The effect of different molecular weights (MW~4 and 1000 kD) and concentrations of Poly (Ethylene Oxide) (0.1-1 %wt) on methane hydrate nucleation time and storage capacity was studied. Experimental results showed that PEO (1000 kD) at concentration of 0.5 %wt gives significant kinetic inhibitory performance and at concentration of 0.25 %wt results in highest methane hydrate storage capacity. PEO significantly enhanced the storage capacity of methane hydrate in comparison with the pure water, as one of the main challenge in gas fuel storage and transportation.

Keywords: Gas hydrate; Polyethylene oxide; Storage capacity; Inhibition

Research Highlights

- PEO significantly enhanced the storage capacity of methane hydrate.
- PEO also showed kinetic inhibitory performance for methane hydrate.
- PEO 1000 kD (0.25 %wt) is a good stabilizer with low A.P.R, high E.G.C.E and S.D values.

1. Introduction

Gas hydrates are solid crystalline compounds form at low temperature and high-pressure conditions (mostly above the freezing point of water). In hydrate crystals, the non-covalent interactions between gas molecules and water molecules stabilize the hydrate structure [1, 2]. In the oil and natural gas industry, inhibiting hydrate formation by chemical compounds is one of the common methods in lowering the risk of hydrate formation and blockage in drilling, production and flow assurance processes [3-5]. Various types of hydrate inhibitors, thermodynamic or kinetic, have been extensively studied [3-12].

In the case of kinetic inhibitors, it is believed that water soluble anti-icing polymers such as poly (N-vinyl caprolactam) or poly (N-vinyl pyrrolidone) are efficient KHIs [4, 9, 10] and