INFLUENCE OF GAS MIXTURE ON LOW DOSAGE GAS HYDRATE INHIBITORS

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ABSTRACT
In a 1.072-liter reactor under the condition of about 8.5MPa pressure and 4°C, Gas hydrate formation with simple natural gas, Green Canyon gas and synthesis field gas mixture was investigated with low dosage gas hydrate inhibitors, GHI1 and Inhibex501. The subcoolings of hydrate formation for these three gas mixtures are 14.7°C, 15.1°C, and 14.2°C respectively. There is no distinguished difference for gas hydrate formation time without inhibitors for few subcooling difference. With Inhibex 501 added, Green canyon gases form hydrates firstly, then synthesis field gases, at last simple gases. With GHI1 added, Green canyon gases form hydrates firstly, and then synthesis field gases and simple gases form almost at same time. The research shows that gas hydrate formation order is influenced by not only driving force, but also LDHIs, and who is important decides by operating condition.

Key words: gas hydrate, low dosage hydrate inhibitors, formation time

Gas hydrates are ice-like crystalline inclusion compounds that form at high pressure and low temperature conditions by hydrogen bonds of water molecules, with the assistance of gases such as methane, ethane, or propane[1]. Natural gas or light hydrocarbon in crude oil can form gas hydrates with proper condition during transportation, which sometimes can result to blockage in pipelines. The oil and gas industry is expanding into deepwater and frozen areas for exploration and production of oil and gas. Thus the problem of hydrate blockages is becoming more of a challenge.

Major efforts are being put forth to use traditional thermodynamic hydrate inhibitors such as methanol, glycol or electrolyte. The effectiveness of these inhibitors is well known, but large concentrations are needed, which impacts the project profits. Some additives such as methanol are also harmful to the environment[2].

Low dosage hydrate inhibitors (LDHIs) have been proposed as a new means of preventing hydrate blockage in flow channels recently. LDHIs include anti-agglomerants (AAs) and kinetic hydrate inhibitors (KHIs). They both can not change the thermodynamics condition of gas hydrate formation, but inhibit and delay hydrates nucleation and growth. Furthermore those inhibitors are added at a low concentration, often less than 1wt% active concentration[2]. Now environment-friendly LDHIs have been used in many fields for its cost-effectiveness. Development of LDHIs has been studied since 90s of last century[3-6] and used successfully in many fields[2,7,8].

Researchers in domain from universities, institutes and oil companies are the main force to study LDHIs, such as Guangzhou institute of energy conversion[9]. Now the blockages of gas hydrates are focused on development of LDHIs. In fact the influence of gas components on LDHIs abilities is

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