A STUDY ON THE DISSOCIATION BEHAVIOR OF GAS HYDRATE USING THE STEAM STIMULATION

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ABSTRACT
Gas hydrates are increasingly considered a potential energy resource. Various methods of exploiting gas hydrates (thermal stimulation, depressurization, inhibitor injection, etc.) have been proposed so far. This research is aimed to introduce the steam stimulation technique to produce natural gas from hydrate deposits. We have carried out an experimental study of gas production to clarify the dissociation characteristics within hydrate-bearing sand by depressurization and/or steam stimulation method. It was measured the change of pressure, temperature and productivity during the experiment. The dissociation analysis was evaluated by the overall gas hydrate dissociation rate. Prior to an experiment the unconsolidated sediments were loaded into reactor, and evacuated to remove air for 12 hr. After the desired initial water saturation was achieved, methane gas was charged into the reactor. During the experiment, the cooling/heating was repeated above 3 times to form hydrate uniformly. After the formation of gas hydrate, the dissociation was driven to thermodynamic non-equilibrium by depressurization and/or steam stimulation methods, where the dissociation temperature of hydrate was specified around 273.15 K and the production pressure was set up under equilibrium pressure of natural gas hydrate in the reactor. In the results, gas production appeared to be sensitive to the gas hydrate specific heat, hydrate saturation and permeability, therefore, it is essential to design factor for the future production when steam stimulation and/or depressurization method will apply.

Keywords: gas hydrates, steam injection, dissociation, productivity

NOMENCLATURE

\( V_{wd} \): methane gas volume in the pores \([m^3]\)
\( \Delta P \): pressure drop due to the gas hydrate formation \([MPa]\)
\( P_0 \): standard pressure \([MPa]\)
\( T_0 \): standard temperature \([K]\)
\( T_f \): gas hydrate formation temperature \([K]\)

A: cross-section of the sample \([m^2]\)
L: length of the sample \([m]\)
\( \Phi \): porosity of the sample

INTRODUCTION
This paper presents the experimental study to analyze the pressure and production behavior