EXPERIMENTAL INVESTIGATION INTO REPLACEMENT OF CH$_4$ IN HYDRATE IN POROUS SEDIMENT WITH LIQUID CO$_2$ INJECTION

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ABSTRACT

Recovering methane from natural gas hydrate (NGH) with CO$_2$ offers a way to store the greenhouse gas for a long term while developing natural gas. In the work, the kinetic behavior of CH$_4$ replacement in the hydrate in porous sediment with liquid CO$_2$ is investigated at 282.2 K and the initial pressure of 6.0MPa using the developed experimental apparatus. The results show that the amount of CO$_2$ hydrate formation is almost equal to that of CH$_4$ hydrate dissociation. This certifies that the CH$_4$-CO$_2$ replacement mainly occurs in the hydrate phase. The replacement efficiency obtained is found to increase with reaction time and trend gradually to a constant value. The recovery ratio of CH$_4$ can reach approximately 45% after 288h, which is higher than the results from bulk hydrate system obtained by Ota et al. (2004).

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