EFFECT OF THE MIXED SOLUTION OF THF AND SDS ON METHANE SEPARATION FROM COAL MINE METHANE BASED ON HYDRATE

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ABSTRACT

The separation and utilization of coal mine methane (CMM) is not only propitious to energy saving but also to environmental protection. To develop more efficient, cost effective technology for the separation and utilization of CMM, this paper proposes a new hydrate-based gas separation (HBGS) method especially for recovering methane from the low-concentration CMM, which has better characteristics including mild reaction condition, high gas storage capacity, and safe storage and transportation. This work is mainly focused on the effect of tetrahydrofuran (THF) and sodium dodecyl sulfate (SDS), using experimental results on simulated CMM (CH₄-N₂-O₂ systems) hydrate separation performance of twelve hydrate tested at different concentrations of THF, SDS, and CH₄. The experimental results show that: (1) CMM gas with the CH₄ content of 24.90vol%, 40.40vol%, 59.50vol% are enriched into methane-rich gas which contained 38.71vol%, 56.03vol%, 79.84vol% CH₄, respectively, only through the first separation stage; (2) The mixed solution of THF and SDS can effectively improve the thermodynamic conditions of gas hydrate separation and shorten the induction time, the higher the SDS concentrations, the shorter the induction time; (3) The gas content in the hydrates drops with raising the SDS concentration in the mixed solution of THF and SDS, indicating the inhibition effect of SDS solution with higher concentration on separation efficiency. Moreover, an attempt was made to explain the effect mechanisms of THF and SDS. Our work provides an example for how mixed solution selectivity may be adopted with speeding up the application of CMM hydrate separation technique.

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