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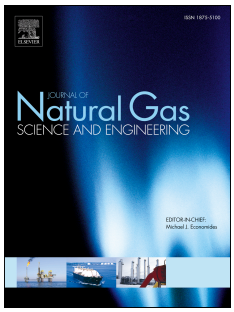

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Assessment of residual trapping in depleted reservoirs used for geosequestration

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Abstract

Carbon capture and sequestration technology is a major approach developed to mitigate the amount of greenhouse gases released into the atmosphere. Technically, depleted oil and gas reservoirs are one of the feasible subsurface geologic media for large-scale carbon dioxide (CO_2) storages. Trapping mechanisms during and after CO_2 injection in geologic formations ensure the long-term safety and security of a storage task. However, depending on characteristics of geologic sites and subsurface conditions, different trapping mechanisms may come to play during sequestration, among which residual trapping is by far the most efficient one in a short-term scale. Although there have been many experimental and numerical studies carried out in the past years to evaluate this trapping potential prior to injection, there is not any field-scale approaches developed to assess CO_2 residual trapping at the depletion stage of oil and gas reservoirs. The aim of this paper is to present a method for residual trapping assessment of CO_2 storage sites by considering related and effective constraints such as residual hydrocarbon saturation, interfacial tension, pore geometry, and wettability. An analytical method based on a adjustment factor was proposed which could be used to determine the residual CO_2 saturation/residual trapping for different rock types having different wetting characteristics. Two wells out of a total number of 20 wells (mostly depleted) from the largest gas field in Malaysia were considered as part of this study to show how the proposed method can be executed in the field scale for determination of the residual trapping ability of the reservoir. The results obtained indicated that the average residual CO_2 saturation by the proposed method is around 26% and 27% for Well A and Well B, respectively. Thus, the maximum volume of CO_2 residual trapped could be approximately 0.96 Tscf or 0.97 Tscf of the effective pore volume (excluding 30% Sgr), based on the average saturations estimated from the data of Well A and Well B. The results were validated both experimentally and numerically where it was found that the proposed method and three phase core flooding experimental data

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