

シール性能パラメータとしての毛管圧

—石油探鉱から CO₂ 地中貯留への展開—

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Capillary Pressure as a Seal Performance Assessment Parameter: Expanding Applications from Petroleum Exploration to CO₂ Geological Sequestration

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Abstract

This paper focuses on capillary pressure, P_c , as a parameter characterizing the sealing performance of rock, and reviews the current status of research on its evaluation method. Fluid sealing due to P_c is one of the most fundamental mechanisms controlling overall mass transport in underground formations. The petroleum exploration community has attempted to gather knowledge on evaluating sealing performance, but currently there is no measurement method that is both accurate and efficient. Moreover, the theoretical model of P_c does not go far beyond an ideal system with a simple and homogeneous internal structure. This aspect makes a theoretical approach to the sealing performance of natural rocks with complex structures difficult. On the other hand, in recent years, the importance of sealing performance has attracted growing interest in risk analyses of CO₂ geological sequestration. As a result, the establishment of a methodology applicable to a CO₂ system, besides resolving the above issues, is desired. Especially from the standpoint of CO₂ geological sequestration, special attention should be paid to estimating the range of variations of P_c in cap rocks because that option requires an assessment over a large injection site in spite of the lack of available core samples. The authors' new approach, which attempts to quantify the effects of various factors on P_c using an artificial sample whose internal structure is fully controlled, might have the potential to contribute to those requirements.

Key words : sealing performance, capillary pressure, threshold pressure, cap rock, petroleum exploration, CO₂ geological sequestration

キーワード : シール性能, 毛管圧, スレッシュホルド圧, キャップロック, 石油探鉱, CO₂ 地中貯留

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