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Water Saturation Dependence on CO_2 Sorption Potential of Sandstones

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ABSTRACT

For the assessment of the carbon dioxide (CO_2) storage potential of water-filled reservoir rocks (i.e., saline aquifers), it should be first important step for a thorough understanding of the effect of water content on CO_2/water/rock interactions during CO_2 injection. The purpose of this study is to examine the CO_2 sorption amount for Kimachi sandstone and Berea sandstone at different water content using the manometric method at temperature of 50?C and pressures of up to 20 MPa. Our results document that a significant quantity of CO_2 was sorbed on the two types of sandstone on all water-saturated bases, which corresponded to the amount adsorbed on the air-dry basis. Also, all the wet samples had significantly higher sorption capacity than the theoretical values calculated from the solubility model based on dissolution of CO_2 in pore water and the pore-filling model, which assumes that the pore volume unoccupied by water is filled with CO_2. Furthermore, the observations indicated a certain degree of correlation between the sorbed amount and the water content, except at pressures below the critical point for Berea sandstone. This investigation points out that CO_2 sorption is a possible mechanism in CO_2 geological storage even under water-saturated conditions and that the mechanism of sorption on silica and silicate minerals plays an essential role in the reliable and accurate estimation of the CO_2 storage capacity of water-saturated reservoirs.

KEYWORDS

CO_2; Water Saturation; Sorption Potential; Sandstones

Cite this paper

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