

Evaluation for the scCO₂ Sealing Capacity of the Mudstone in the Janggi Basin, Korea

Jeongpil An¹, Taehyoung Kim¹, Jinkyun Lee¹, Minhee Lee¹, Sookyun Wang² and Seon-Ok Kim²

¹Department of Environmental Geosciences, Pukyong National University, South Korea

²Department of Energy Resources Engineering, Pukyong National University, South Korea

The scCO₂ (supercritical CO₂) sealing capacity of the mudstone as a cap-rock in the Janggi basin, Korea was evaluated, measuring the initial scCO₂ injection pressure. The mudstone core (4.2 cm in diameter and 5 cm in length) was fixed in a stainless steel cell covered with a heating jacket to maintain at 50 °C, and then was saturated with distilled water at 100 bar to simulate the scCO₂ storage conditions under the subsurface. The scCO₂ was contacted to the surface of the mudstone core in the cell using a syringe pump at the range of 100 - 250 bar until the scCO₂ began to penetrate into the water-saturated mudstone core, and the initial injection pressure of scCO₂ into the mudstone was measured. From the experiment, the initial scCO₂ injection pressure of the mudstone core was 240 bar ($\Delta P=140$ bar), which was much higher than that of the tuff in Janggi basin ($\Delta P=15$ bar), suggesting that the mudstone in Janggi basin was more suitable than the tuff to prevent the scCO₂ leakage from the scCO₂ storage rock. The amount of the scCO₂ replacing water in pore spaces of the mudstone core was measured to estimate the scCO₂ storage capacity of the mudstone. After more than 3 pore volumes of the scCO₂ was flushed out from the mudstone core, the scCO₂ storage ratio was calculated from the amount of water drained out from the mudstone core. The conglomerate was considered as a provisional the scCO₂ storage rock in Janggi basin, and its average scCO₂ storage ratio was measured as 31.21%. In this study, the average scCO₂ storage ratio of the mudstone was calculated as 11.24 %, which was lower than that of the conglomerate in Janggi basin. By considering the high initial scCO₂ injection pressure and the low scCO₂ storage ratio, the mudstone in Janggi basin could be the successful cap-rock to shield the scCO₂ leakage from the scCO₂ storage rock in the Korea.