

Assessment of Janggi Conglomerate as CO₂ Sequestration Reservoir Using Micro CT Images and Numerical Modeling

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Abstract

Carbon dioxide (CO₂) emissions from anthropogenic and natural sources to the atmosphere will need to be reduced to varying degrees worldwide for mitigating climate change. Efforts to mitigate environmental impacts from increased atmospheric CO₂ concentrations have suggested that geologic carbon sequestration (GCS) can possibly be used to reduce the amount of CO₂ emitted to the atmosphere. As an example of the GCS site, the Janggi basin was targeted to demonstrate an onshore CO₂ injection project in South Korea. To evaluate Janggi conglomerate as a CO₂ reservoir, this study utilized Micro-CT image analysis and Numerical modeling for drilling core samples (Core I and II) of the Janggi conglomerate.

CT images for core samples of which the resolution was 62 μm were obtained. After preprocesses (cropping and filtering processes) for improving accuracy and precision of the analyses, the segmentation process between pores and grain-matrix was conducted by varying the threshold CT value until acquiring reasonable value between experimentally determined porosity (16.1%) and the porosity calculated from CT images. Absolute and effective porosity of Core I and II were quantified. Here, isolated pores, or difference of total pores and connected pores, were observed in different parts of the core such as clast and matrix. Although pore volumes of Core I (18,598 mm³) and Core II (18,621 mm³) were almost equivalent, the number of pores of Core I (225,982) was larger than that of Core I (117,143). Subsequently, by adopting numerical modeling, permeabilities were calculated and therefore CO₂ migration and distribution were evaluated in the conglomerate.

Keywords: *Micro-CT image, GCS, Numerical simulation, Conglomerate.*