

CO₂ 저장량 최적화 및 증대를 위한 다중 스케일 평가기술 개발

Development of multi-scale assessment to optimize and maximize CO₂ storage capacity



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최종연구목표

- 대염수층 저장부지 내 CO₂ 저장량을 극대화하기 위한 다중 스케일 평가 기술을 개발하고 이에 대한 적용성을 확보

주요연구내용

- 다공성 지반재료의 공극구조 정량화
- 주입조건 및 공극 구조 변화에 따른 다성분/다상 유동 모사
- 저장 열역학적 데이터 구축
- CO₂ 저장량 최적화 모델 및 주입 조건 평가

기대효과

- CO₂ 저장량 평가의 원천기술 확보 및 실증 저장 플랜트 설계 및 운용에 적용
- 잔류상의 존재가 기술적 문제가 되고 있는 비정통 에너지 개발 분야에 핵심 기술로 적용 가능
- 극한 상태에서의 열역학적 데이터 및 저장량 최적화에 사용되는 요소 기술은 지반 환경 및 에너지 공학 분야로 접목 가능

Research Goals

- The objective thus targets securing the in-situ applicability by developing multi-scale evaluation technology to maximize CO₂ storage capacity within the limited deep-saline geological formation

Research Contents

- Characterization of internal pore structure
- Simulation of multicomponent/multiphase fluid depending on injection condition and pore configuration such as discontinuity
- Establishment of thermodynamic database
- Assessment of injection condition and optimized model for CO₂ storage capacity improvement

Expected Effects

- The optimization technology to enhance CO₂ storage capacity leads to the securement of originality, application to design and operation of storage plants
- It is applicable for unconventional energy recovery relevant to the complexity stemming from the existence of residual phase
- Thermodynamic database and key techniques under investigations can embrace geoenvironmental and energy engineering

기술개발 TRM

Contents	Stage 1		Stage 2			Stage 3		
	2012~2013	2013~2014	2014~2015	2015~2016	2016~2017	2017~2018	2018~2019	2019~2020
Construct DB of internal pore structure of CO ₂ storage rock	Develop pore quantifying method for porous rock		Establish DB for pore characteristics of rock using in-situ storage rock in Korea			Assess characteristics of pore and discontinuity of storage rock in storage plant		
Research of Residual phase saturation phenomena	Verify concept of residual phase variation by condition of injection		Analysis of residual phase saturation in pore scale		Suggest model for residual phase saturation	Establish method for residual phase saturation analysis in macro scale		
DB establishing of CO ₂ reaction phenomena	Research about the reaction in rock/brine/CO ₂ system		Assess capacity of chemophysical CO ₂ adsorption/absorption of storage rock			Measure/analysis mechanism for accuracy of prediction of underground storage plant		
CO ₂ storage model development	Literature review for Optimized storage of CO ₂ in the world		Research about CO ₂ storage model with multi scale			Establish model for CO ₂ storage capacity assessment		Optimize condition of injection in storage plant