

# CO<sub>2</sub> 포집 공정 시뮬레이션 및 공정 최적화

Simulation and process optimization of CO<sub>2</sub> absorption process



이 광순 (kslee@sogang.ac.kr)  
서강대학교  
• Kwang Soon Lee  
Sogang Univ.

## 최종연구목표

- 신규 흡식 흡수제에 적합한 에너지 절감형 흡식 공정 개발
- 열통합 범용 시뮬레이터 기반 건식 흡수제를 이용한 연속식 다단 포집 공정 개발

## 주요연구내용

### <습식 공정>

- 수계/저수계/비수계 공정 시뮬레이터 개발
- 최적 공정 설계 및 운전 조건 가이드라인 제시
- 흡수제 요구사항 도출

### <건식 공정>

- 기포/고속 유동층, 향류 이동층 공정 모델링
- 열 통합 범용 시뮬레이터 구축, ≥60% (열 저감율 기준)
- Bench 규모 공정 성능 예측 및 설계
- Lab-scale 향류 이동층 공정 흡수탑 설치

### <공통>

- 흡수제 별 경제성 평가 시스템 구축

## 기대효과

- 에너지 절감형 이산화탄소 포집 최적 공정설계 및 운전 조건 제시
- 다양한 흡수제에 대한 이산화탄소 포집 공정 설치시 성능, 가격, 사용에너지 예측치 제공
- 시뮬레이터를 이용한 공정 개발 기간 단축

## Research Goals

- Low energy demanding process development using new absorbents
- Development of continuous multi-stage dry sorbent process based on a general purposed simulator

## Research Contents

### <Aqueous solvent process>

- Simulator development of aqueous/non-aqueous absorption process
- Provide guidelines on process development and operating conditions
- Provide guidance on absorbent development

### <Dry sorbent CO<sub>2</sub> capture process>

- Process modeling of bubbling/fast fluidized bed, counter-current moving bed
- Develop a general purposed heat integrated simulator, ≥60% (energy recovery basis)
- Process design of a bench scale plant
- Install a lab-scale counter-current moving bed absorber

### <Common>

- Develop economy evaluation package

## Expected Effects

- Provide optimal processes design and operating guidelines of a low energy demanding CO<sub>2</sub> capture process
- Provide estimations on cost, energy requirement, and performance of carbon capture process using various absorbents
- Promote process development using developed simulators

## 기술개발 TRM

Contents	Stage 1			Stage 2			Stage 3		
	2011~2012	2012~2013	2013~2014	2014~2015	2015~2016	2016~2017	2017~2018	2018~2019	2019~2020
Aqueous process	Simulator development of aqueous and low-aqueous solvent process using bench scale data / process design / optimization / parameter estimation / economy evaluation			Simulation of aqueous and low-aqueous solvent process using pilot-scale data / process design / optimization / parameter estimation / economy evaluation			Simulation refinement and process modification of low-aqueous solvent process		
	Simulator development using non-aqueous solvent			Simulation of non-aqueous solvent bench-scale process / process design / optimization / parameter estimation / economy evaluation			Simulation of non-aqueous solvent pilot-scale process / process design / optimization / parameter estimation / economy evaluation		
Dry process	Development of general purposed heat integrated simulator(bubble / fast fluidized, countercurrent moving bed)			Simulator improvement based on bench-scale experimental results / process optimization / parameter estimation / economy evaluation			Simulator improvement based on pilot-scale experimental results / process optimization / parameter estimation / economy evaluation		
	Heat integrated network modeling / process optimization / bench-scale plant design			Design of pilot-scale plant / process optimization			Capture process design for 500MWe coal plant / process optimization		