

에너지 교환형 다단 유동층 CO₂ 포집기술 개발

Development of CO₂ capture technology using energy exchangeable fluidized-bed



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최종연구목표

- 에너지 교환 흡수 공정의 개념 정립 및 검증
 - 열 회수율 40% 이상
 - 성형 흡수제의 내구성 3000회 이상
 - Host-Guest 개념의 흡수제 재생 기술 개발

주요연구내용

- 반응기 형태 선정 및 flow pattern 결정
- 다단 흡수 공정 적용 가능성 확인을 위한 alloy계 흡수제의 온도별 흡수/탈착능 평가
- 2단식 연속 흡수/탈착탑의 설계 및 제작
- 비활성화된 흡수제의 재생효율을 높이기 위한 Host-guest 개념의 흡수제 설계
- 연속운전에 적합한 성형흡수제의 제조 및 온도별 흡수/탈착능 평가
- 2단 연속 흡수 공정 운전을 통한 벤치 규모의 다단식 흡수 공정 설계 자료 확보

기대효과

- 경제적인 건식 CO₂ 포집 기술을 화력발전소, 제철소 등의 CO₂ 대량배출원에 적용
- 국내 석탄 화력 발전에 적용시 경제적 효과
 - 120 Mt-CO₂/y (2020 이후 저감량) x \$30/t-CO₂ (탄소배출권 가격) = 3.6 B\$/y

Research Goals

- Establishing and verifying the concept of CO₂ capture process using energy exchangeable fluidized beds
 - Energy recovery > 40 %
 - Durability of a shaped CO₂ absorbent > 3000 cycle
 - Developing regeneration technology of CO₂ absorbents based on host-guest concept

Research Contents

- Determining the reactor types and the flow pattern
- Evaluating absorption and desorption rate of CO₂ at various temperatures using alloy-type sorbents
- Design and manufacture of 2 step absorption/desorption beds
- Design of new sorbents using host-guest concept to improve the regeneration efficiency
- Manufacture of shaped sorbents suitable for continuous operation and evaluation of absorption/ desorption of them
- Gathering data for design of bench-scale multistep absorption process by operating 2 step absorption process

Expected Effects

- Application of an economic dry sorbent CO₂ capture technology to mass CO₂ producing places like power plants and ironworks
- Economic effect when applied to domestic coal power plants
 - 120 Mt-CO₂/y (reduced amount after 2020) x \$30/t-CO₂ (carbon credit price) = 3.6 B\$/y

기술개발 TRM

Contents	Stage 1			Stage 2			Stage 3			2020~	
	2011~2012	2012~2013	2013~2014	2014~2015	2015~2016	2016~2017	2017~2018	2018~2019	2019~2020		
Development of temperature-tailored CO ₂ sorbents	High temp..Development of inorganic sorbents			Selection of sorbents & optimization						Large scale verification & commercialization	
	Intermediate temp..Development of organic/inorganic hybrid & alloy sorbents										
Shaping of recyclable sorbents & development of mass production	Low temp..Development of carbon-based & organic sorbents			Improvement of sorbents related to process & development of recycling technology			Improvement of sorbents related to process				
	Development of host materials for sorbent impregnation		Encouragement of material companies' participation		Development of sorbent mass production technology			Commercialization of sorbents			
Development of multi-step CO ₂ absorption process	Development of sorbent shaping technology				Encouragement of CO ₂ capture companies' participation						
	Composition of multi-stage CO ₂ capture process & verification of the technology			Design of multi-stage CO ₂ capture process							
	Interpretation of sorbents flow			Design of CO ₂ capture process related to liquefaction			Verification of pilot (0.1 MW) multi-stage CO ₂ capture process				
	Realization of bench-scale multi-stage CO ₂ capture process										