

고효율 저에너지형 비수계 이산화탄소 흡수제 개발

Development of high-capacity, energy-efficient anhydrous carbon dioxide absorbents



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최종연구목표

- 저온에서 이산화탄소 흡수 및 탈착이 가능한 혁신적인 비수계 유기 이산화탄소 흡수제의 제조/가공/적용 기술 개발

주요연구내용

- 비수계 유기 CO₂ 흡수제 합성
 - CO₂ 흡수능 20% 이상의 비수계 superbase 및 아민 흡수제 합성
- 비수계 흡수제 화학구조 다양화 및 최적화
 - 화학적 구조 다양화, 조성 및 상태별 흡수/재생 특성화를 통한 흡수 성능 개선
 - 열화안정성, 손실율, 제조방법 및 단가 등의 제고를 통한 최적 물질 선별
- 벤치스케일 흡수 공정 구현 및 유망흡수제 선별
 - 모사 가스에서 CO₂ 흡착 분리 및 흡수제 재생 실험
 - 유망 흡수제 합성 스케일업 및 최적 흡수제에 대한 공정 개념 도출

기대효과

- 저온용 비수계 CO₂ 흡수성 유기 화합물 원천 기술 개발로 기존 습식 공정의 단점 해결 가능
- 흡수공정의 에너지 소비 및 유지, 보수에 필요한 여러 요소의 비용을 절감함으로써 저에너지형 CO₂ 포집 기술 실용화 가능
- 효율적 포집에 의한 CO₂의 산업자원으로 재사용 기대
- 신규 유기 흡수제와 패키지로 공정 개발될 경우 국제적 탄소 기술 경쟁력 확보 및 국부 창출에 기여

Research Goals

- To develop synthesis, processing, and application technologies of innovative anhydrous absorbents that can capture and release CO₂ at low temperature

Research Contents

- Anhydrous organic carbon dioxide absorbents
 - Synthesis of anhydrous superbase or amines absorbing carbon dioxide over 20%
- Optimization of chemical structure and composition of absorbents
 - Enhancement of capture performance through tuning of chemical structure, mixture type and compositions
 - Selection of candidate absorbents through thermal stability, loss, synthesis method optimization
- Demonstration of bench scale continuous capture/regeneration process
 - CO₂ capture and absorbent regeneration with simulated gas mixtures
 - Scale up synthesis of best absorbents and development of process concept for the optimized absorbents

Expected Effects

- By developing low-temperature anhydrous organic CO₂ absorbents, disadvantages of the conventional wet capture carbon capture process can be removed
- Energy consumption of capture process and the cost for maintenance and repair can be greatly reduced to enable realization of the carbon capture technology
- Efficient capture technology enables reuse of CO₂ as a industrial resource
- The development of the new capture process technology combined with the new absorbents will lead the international carbon capture industry contributing to national economy

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
Development of anhydrous CO ₂ absorbents	Synthesis of prototype anhydrous organic CO ₂ absorbents			Enhancement of capture performance and synthesis scale up			Optimization of absorbents and large scale synthesis for pilot scale application		
	- Synthesis of absorbents tuning of chemical structure and compositions and characterization - Define process concepts using synthesized absorbents			- Improvements of performance and durability and synthesis scale up - Establishment of a continuous lab scale process			- Development of the anhydrous absorbents with performance, durability, and synthesis methods optimized for continuous process		