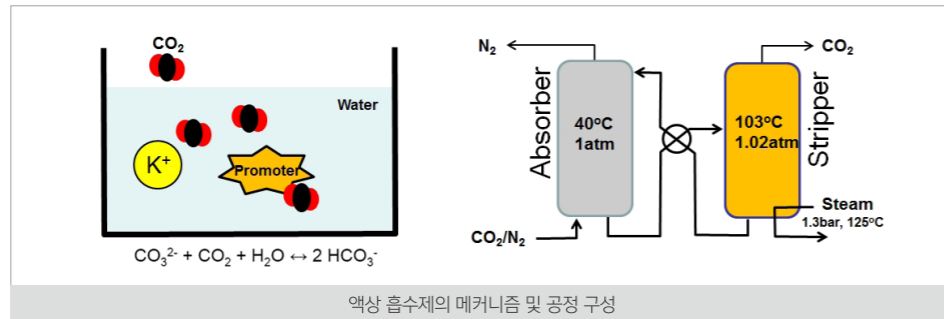


연구책임자
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윤여일

연소후 CO₂ 포집 기술, KIERSOL

지구온난화 방지를 위한 CCS(CO₂ Capture & Storage) 기술 중 액상포집 기술. 속도 촉진형 탄산칼륨 수용액을 활용한 CO₂ 흡수 기술, 2030년 온실가스 자연증가분 대비 한국 감축목표 37% 중 1000 만톤 활용 예측.

기술의 구성도/개념도



- 흡수제의 셔틀 메커니즘을 이용하여 기상의 CO₂를 수용액에 흡수 분리한 후 재생탑에서 스팀 재생하여 연속 운전하는 공정

기술의 주요 내용 및 특징

- 초미세먼지/CO₂ 배출 산업에 적용 가능한 경제적 CO₂ 흡수제 및 공정 기술
 - 연구기간 : 12년 4개월, 투입 연구비 : 194억원 (과기부/산업부)
 - 세계 최고 수준(일, 미츠비중공업사)보다 30% 경제성 우수한 CO₂ 포집기술
 - CO₂ 포집 공정 기본 설계, 성능 보증 및 개런티 수준까지 기술 확보
 - 예상 적용처 : 발전소, 제철소, 시멘트, 석유화학, 바이오가스 고질화, 보일러
 - 선행 기술 이전 계약 완료 : 현대기아자동차 (2012.9), 기반 (2015.9)

기술의 적용처

응용분야	적용제품	적용공정	흡수제
발전, 제철, 시멘트, 석유화학	CO ₂ 포집기술 CO ₂ 포집용 흡수제		

문의
한국에너지기술연구원
기술사업화실

TEL
042-860-3384

E-mail
kier-tlo@kier.re.kr

- 기술의 비교우위성/ 기존 기술 대비 차별성

- 실험 및 실증 데이터

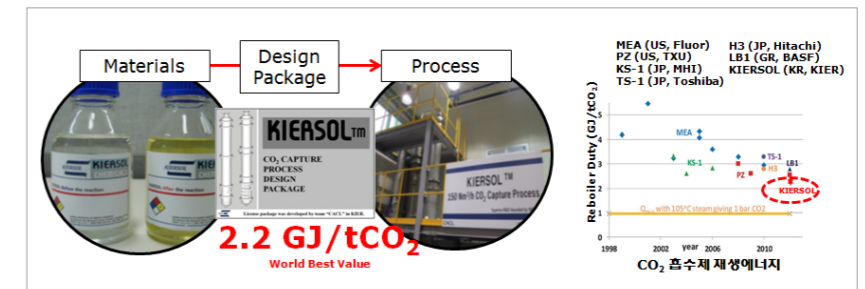
- 기술의 성숙도

- 지식재산권 현황

기존 기술	본 기술
<ul style="list-style-type: none"> 선도 그룹(MHI(일), Fluor(미)) - CO₂ 포집비용 : 35~40 \$/tCO₂ - 공정 대용량 테스트 : 670 MW 	<ul style="list-style-type: none"> 본 기술 (KIERSOL) - CO₂ 포집비용 : 27 \$/tCO₂ - 테스트 공정 규모 : 0.5 MW

경쟁 기술과 KIERSOL 성능 비교

Based on water as a solvent	Alkanolamine		Benfield (UOP)	KIERSOL (KIER)
	MEA (Fluor)	KS-1 (MHI)	K ₂ CO ₃ /H ₃ BO ₄	K ₂ CO ₃ /amine
Regeneration E (GJ/tCO ₂)	2.8~2.9	2.4~2.6	3.8	2.2
Cost (USD/kg)	1.2	16.5	?	2.8
Make up (kg/tCO ₂)	1.5	0.35~0.4	2.4	0.2
Anti-corrosion(wt%)	0.5	?	0.5~1.0	0.0
SO ₂ effect (ppm)	10	1.5	?	After Quenching
Process (°C, 1atm)	Absorber	50~60	100°C (9 atm)	40~50
	Stripper	120	120	103



[TRL 6: 파일럿 규모 시작품 제작 및 성능 평가]

~ [TRL 7: 신뢰성평가 및 수요기업 평가]

순번	발명의 명칭	출원번호	출원일자	등록번호	등록일자
1	입체저항 사이클릭 아민에 의해 효율이 향상된 알칼리 탄산염계 CO ₂ 흡수제 및 이를 이용한 이산화탄소 제거 방법	10-2009-0131571	2009.12.28	10-1157141	2012.06.11

핵심 소재 특허 등록 국가 : 한국, 중국, 호주, 미국, 캐나다, 인도

국내 출원 28, 국내 등록 45, 해외 출원 41, 해외 등록 13

Principal researcher
 Yoon Yeo-Il
 Greenhouse Gas Laboratory of the Climate Change Research Division

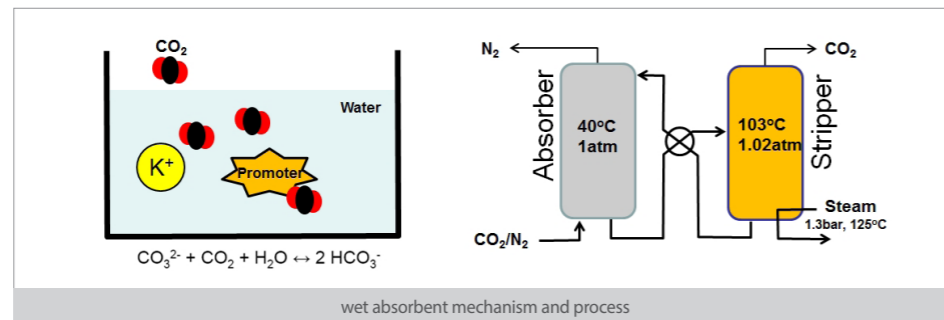
Post-combustion CO₂ capture technology, KIERSOL

CO₂ capturing technology is one of CCS (CO₂ Capture & Storage) technologies for preventing global warming

This technology is one of the wetabsorption methods and a promoted potassium carbonate solution is used as an absorbent.

The technology predicts to abolish 10 million tones of greenhouse emissions, while Korea's goal is to reduce emissions by 37% by 2030, to compensate for the spontaneous increase.

Structural Diagram/Conceptual Diagram




In the continuously operated process, the gas-phase CO₂ is absorbed by the aqueous solution for separation by using the shuttle mechanism of the absorbent, and then regenerated by steam in the stripper.

Description and Characteristics of Technology

- Economically feasible CO₂ absorbent and process technology applicable industries emitting micro-dust and CO₂
 - Research period: 12 years and 4 months; Input research fund: 25.9 billion KRW (Ministry of Science & Technology/Ministry of Trade, Industry and Energy)
 - The CO₂ capturing technology has economic feasibility 30% higher than the world's top technology (Mitsubishi Heavy Industries, Ltd., Japan)
 - The technology has been developed to secure the basic design of the CO₂ capture process and guarantee the performance.
 - Potential applications: power plants, ironworks, cement industry, petrochemical industry, biogas purification, and boilers
 - Technology transfer contracts were concluded with Hyundai and Kia Motor Group for the preliminary technology (Sep, 2012), the application for biogas upgrading (Sep, 2015) and CO₂ absorbent for petrochemical industry (Nov. 2018).

Scope of Application

Application Fields	Products
Power generation, iron industry, cement industry and petrochemical industry	CO ₂ capture technology, CO ₂ capturing absorbent



KIERSOL process absorbent

Inquiries
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 042-860-3384

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 kier-tlo@kier.re.kr

Comparative advantages of technology / Differentiation from existing technologies

Experimental and empirical data

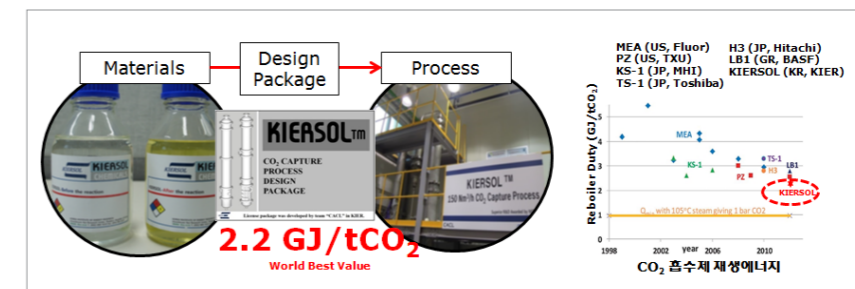
Maturity level of technology

Current status of intellectual property rights

Conventional Technology	Present Technology
<ul style="list-style-type: none"> Leading groups (MHI (Japan) and Fluor (US)) - CO₂ capturing cost: 35 to 40 \$/tCO₂ - High-capacity process test: 670 MW 	<ul style="list-style-type: none"> Present Technology (KIERSOL) - CO₂ capturing cost: 27 \$/tCO₂ - Test factory scale: 0.5 MW

Performance comparison of KIERSOL with competing technologies

Based on water as a solvent	Alkanolamine		Benfield (UOP)	KIERSOL (KIER)
	MEA (Fluor)	KS-1 (MHI)	K ₂ CO ₃ /H ₂ BO ₄	K ₂ CO ₃ /amine
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	Stripper	120	103	103



[TRL 6: pilot-scale prototype preparation and performance evaluation]
 ~ [TRL 7: Reliability evaluation and evaluation by demanding company]

No.	Title of Invention	Application Number	Application Date	Registration Number	Registration Date
1	CO ₂ absorbent based on alkali carbonate solution promoted by hindered cyclic amines and CO ₂ removing method using the same	10-2009-0131571	2009.12.28	10-1157141	2012.06.11

Countries where the core material has been patented: Korea, China, Australia, US, Canada, and India

Patent application in Korea 28, Patent registration in Korea 45, International patent application 41, International patent registration 13