

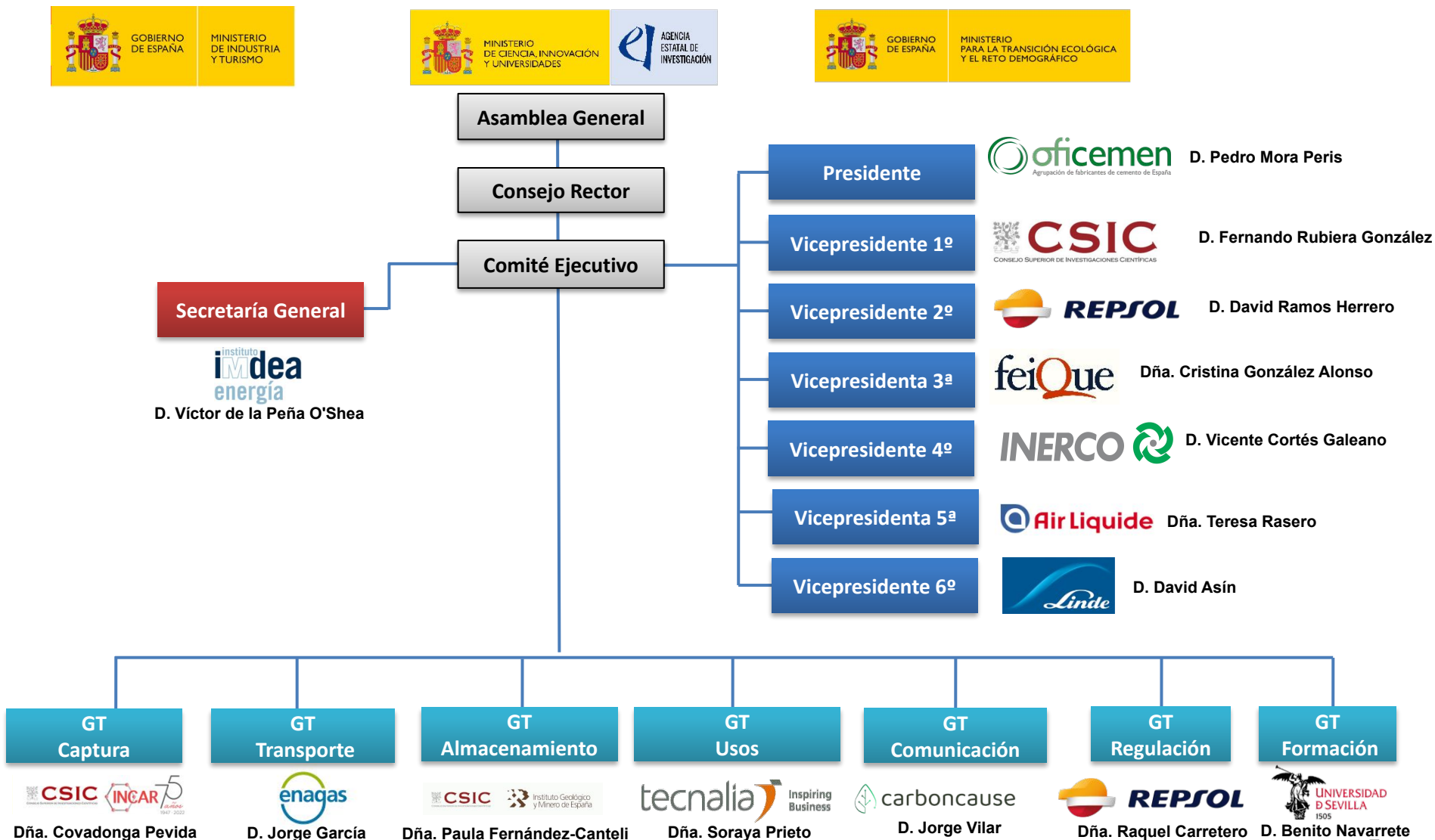
# I+D en tecnologías de captura de CO<sub>2</sub> para la transición energética

Carlos Abanades, CSIC-INCAR  
c.abanades@csic.es

- Estructura de la PTECO2
- Ejemplo proyectos I+D: *Calcium Looping* para captura de CO<sub>2</sub> en industrias no descarbonizables



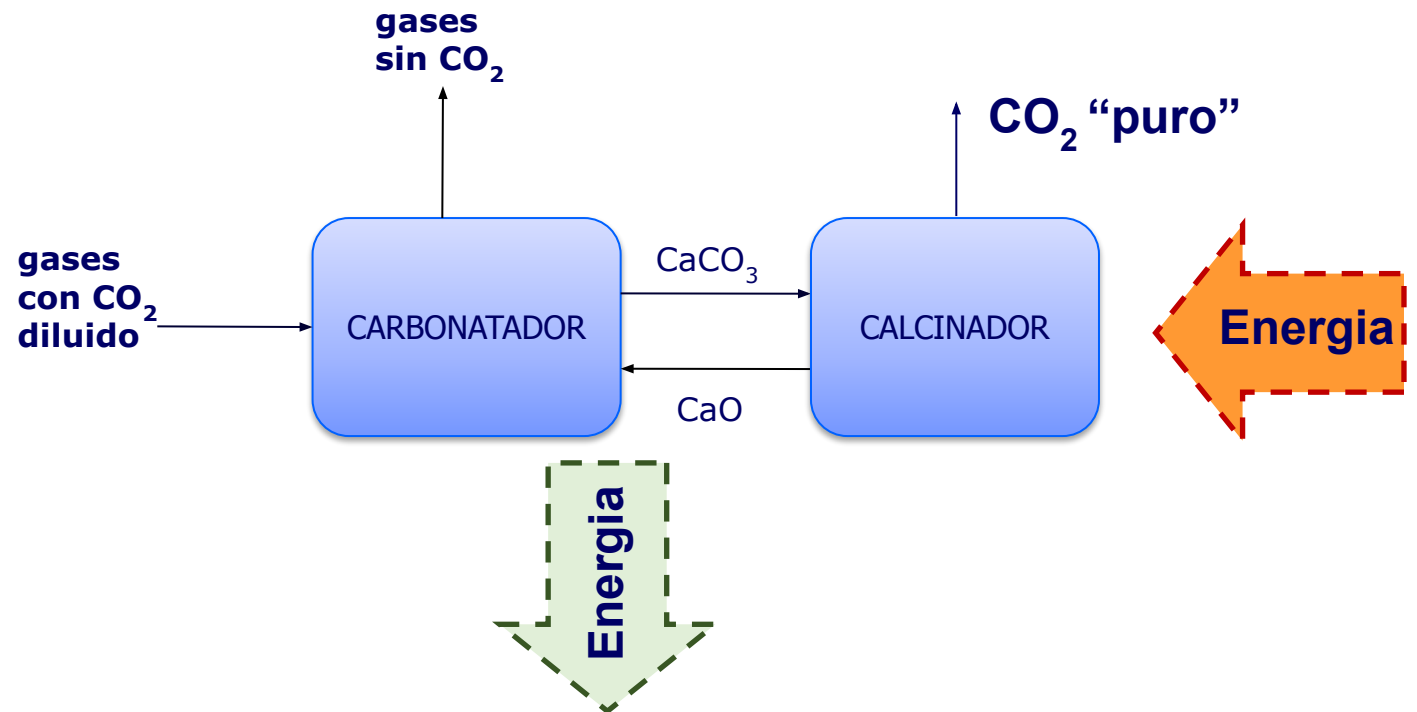
# PTECO2: Estructura



# Calcium Looping para captura de CO<sub>2</sub> en industrias no descarbonizables

## VENTAJAS TEORICAS

- Altos rendimientos energéticos cuando se recupera energía carbonatación
- Bajo coste sorbente (cal)
- Co-captura de SO<sub>2</sub> (Efi>99%)
- Puede tratar gases muy contaminados, calientes con polvo...



# Descarbonización de la Industria

Demostración de nuevas tecnologías de captura de CO<sub>2</sub> para industrias intensivas en carbono  
Tecnologías basadas en ciclos de carbonatación-calcinación (Calcium Looping)

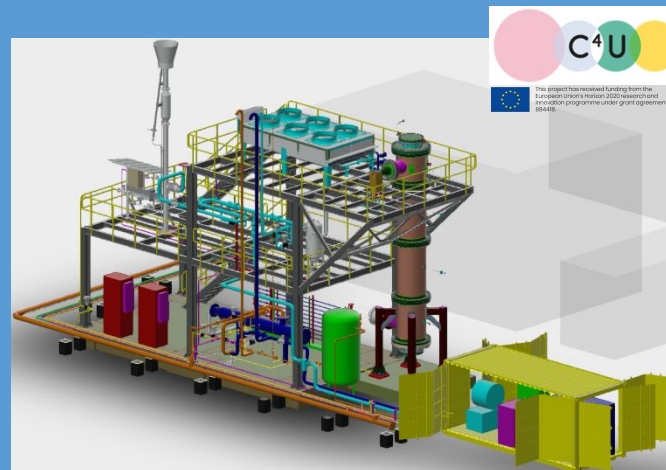
## Actuaciones:

Descarbonización de industrias no  
electrificables: Adaptación de “La Pereda CO<sub>2</sub>”  
a sectores industriales de WtE.  
Patente CSIC: EP21383230



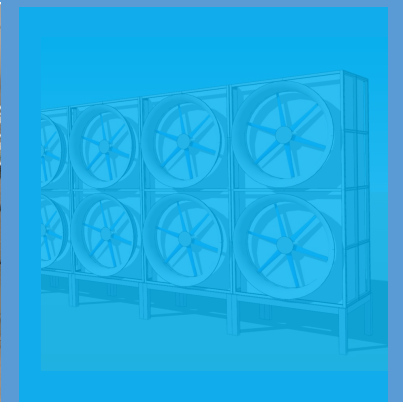
Producción de hidrógeno a partir de gases  
residuales ricos en CO: CASOH alta presión

Patentes CSIC: EP09382169 y US8506915B2



Captura de CO<sub>2</sub> de fuentes dispersas:  
Nuevo piloto CaL para captura de CO<sub>2</sub> de  
fuentes dispersas (incluida la atmósfera)

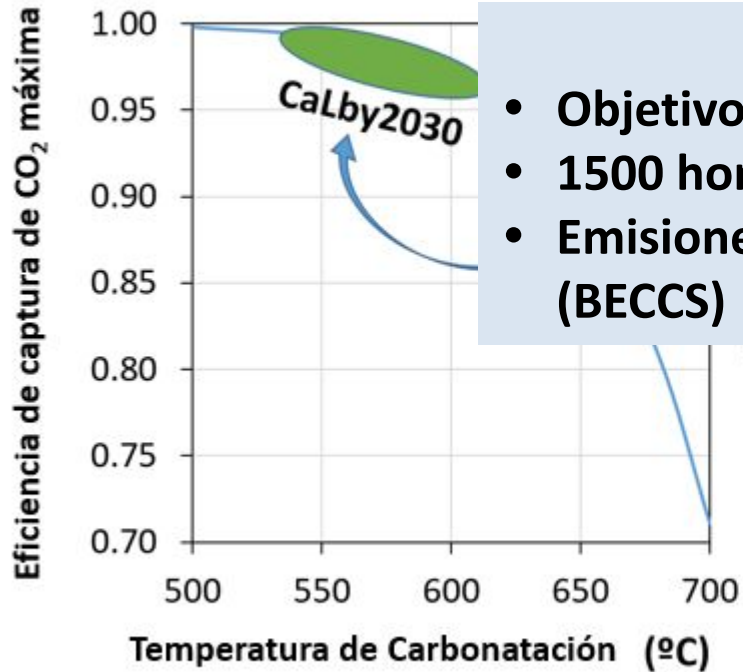
Patentes CSIC: EP 21382947 y EP21382495



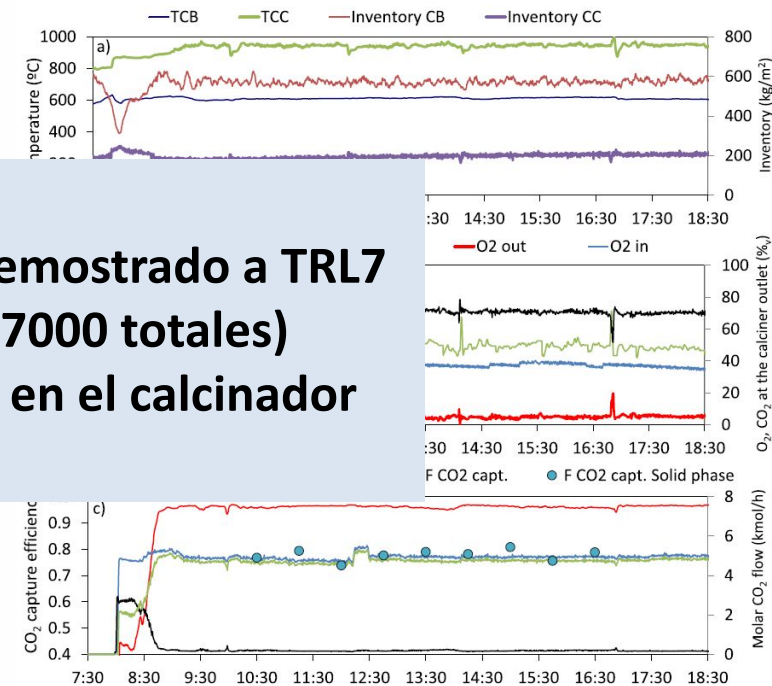
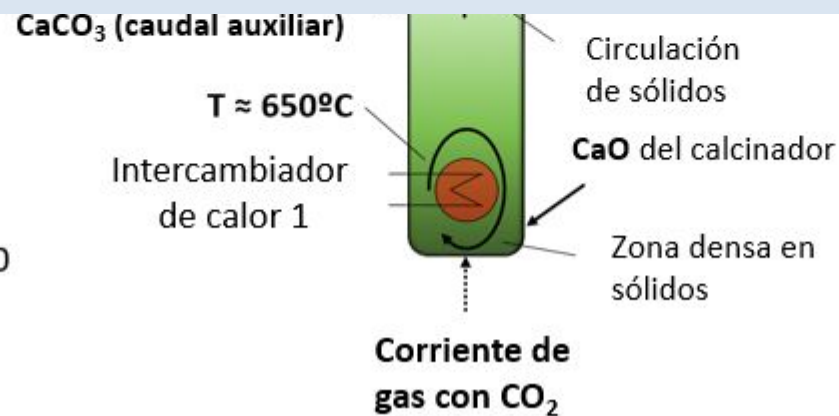
# La Pereda: Planta piloto de captura de CO<sub>2</sub> con “Calcium Looping”



# La Pereda: Planta piloto de captura de CO<sub>2</sub> con “Calcium Looping”



- Objetivo de eficacia de captura de CO<sub>2</sub> > 99.5% demostrado a TRL7
- 1500 horas de nueva experiencia de operación (>7000 totales)
- Emisiones negativas cuando quemamos biomasa en el calcinador (BECCS)



**energy&fuels**

Pilot Testing of Calcium Looping at TRL7 with CO<sub>2</sub> Capture Efficiencies toward 99%

Published as part of Energy & Fuels virtual special issue “2024 Pioneers in Energy Research”. Borja Arias, Yolanda Alvarez Criado, Alberto Méndez, Paula Marqués, I. Finca, and J. Carlos Abanades\*

Cite This: Energy Fuels 2024, 38, 14757–14764

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Patente Europea CSIC: EP21383230



www.calby2030.eu



Funded by the European Union

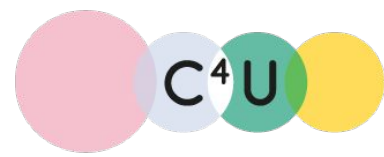
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12.12.2023









# Descarbonización de gases de horno alto en la planta piloto CASOH en ArcelorMittal

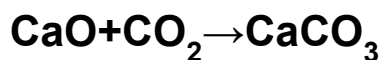
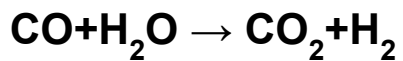


# ETAPAS EN EL PROCESO CASOH

(SE OMITEN POR SIMPLICIDAD LAS DE OXIDACIÓN Y LOS INTERCAMBIOS DE CALOR)

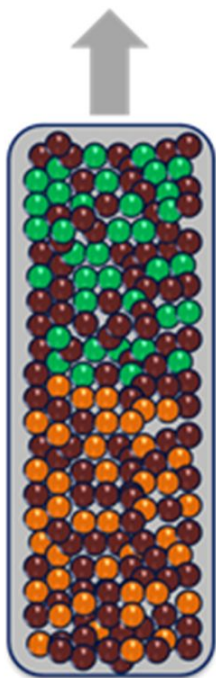
-  Cu
-  CuO
-  CaCO<sub>3</sub>
-  CaO

## CASOH

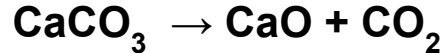
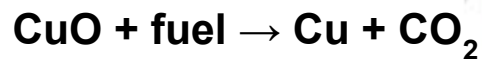


**T=600-700 °C**

H<sub>2</sub> rich gas  
(>90 %v db)

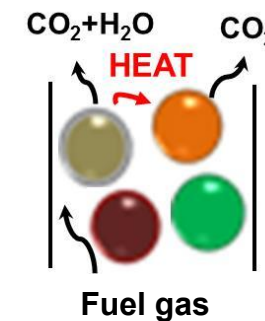
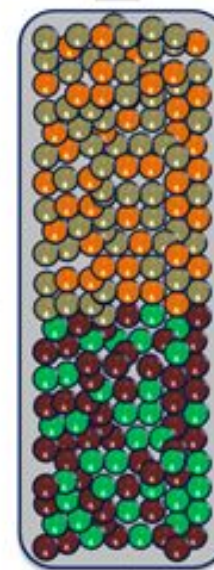


## CuO Red CaCO<sub>3</sub> Calc



**T=850-900°C**

CO<sub>2</sub>+H<sub>2</sub>O



**BFG (CO+CO<sub>2</sub>+N<sub>2</sub>+others)  
+Steam**

**Fuel gas  
(BFG, NG, COG etc)**

CHEMICAL ENGINEERING RESEARCH AND DESIGN 191 (2023) 507–522

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Chemical Engineering Research and Design

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**Blast furnace gas decarbonisation through Calcium Assisted Steel-mill Off-gas Hydrogen production. Experimental and modelling approach**

G. Grasa<sup>a,\*</sup>, M. Díaz<sup>b</sup>, J.R. Fernández<sup>b</sup>, A. Amieiro<sup>c</sup>, J. Brandt<sup>d</sup>, J.C. Abanades<sup>b</sup>

<sup>a</sup> Environmental Research group, Instituto de Carboquímica (Spanish National Research Council), ICB-CSIC), Miguel Luesma Castán 4, 50018 Zaragoza, Spain

<sup>b</sup> CO2 Capture Group, Instituto de Ciencia y Tecnología del Carbono (Spanish National Research Council, INCAR-CSIC), Francisco Pintado Fe, 26, 33011 Oviedo, Spain

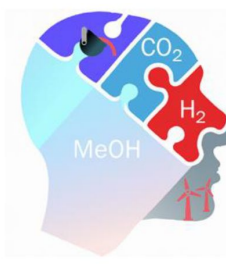
<sup>c</sup> Johnson Matthey Technology Centre, Reading RG4 9NH, United Kingdom

<sup>d</sup> Carmeuse Research and Technology, Louvain-la-Neuve 1348, Belgium

# CSIC: Moving Bed carbonator technology



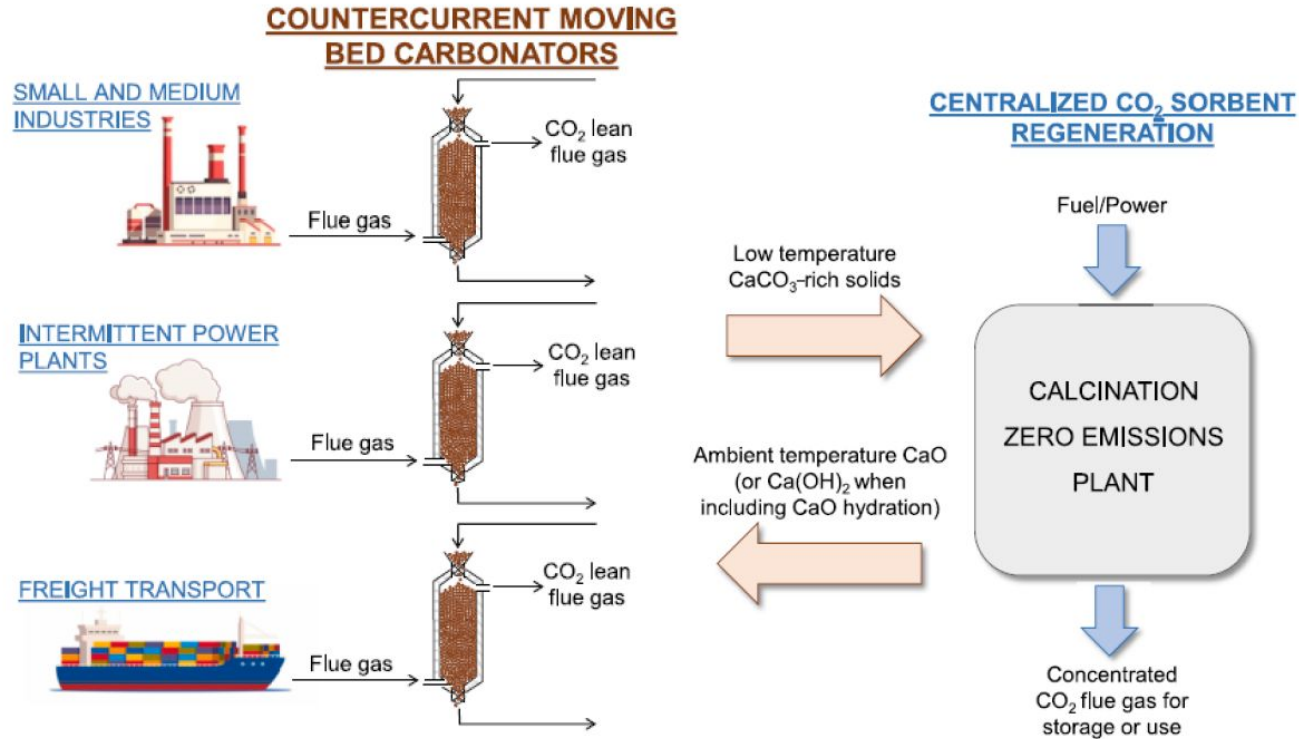
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## Moving bed carbonator reactor

- ✓ Specially suitable for discontinuous flue gas sources
- ✓ Autothermal carbonation zone is maintained by feeding solids and gas at close-to-ambient temperature
- ✓ Typical operation conditions in the range of exiting shaft kilns
- ✓ Operation conditions can be adapted to different flue gas compositions

## Scheme of the decoupled Calcium Looping (d-CaL) process for different disperse CO<sub>2</sub> emitters



## Moving bed carbonator scheme



# Para concluir

- ❑ **Las tecnologías de Calcium Looping se acercan cada vez más a escala comercial porque pueden ser especialmente adecuadas para sectores “difíciles de descarbonizar”.**
- ❑ **El CSIC ha liderado en Europa el desarrollo de estas tecnologías en los últimos 20 años, con más de 12 proyectos (3 coordinados, 3 vigentes), +10 patentes activas (6 transferidas), varias de las publicaciones más citadas en el campo...**



Funded by  
the European Union

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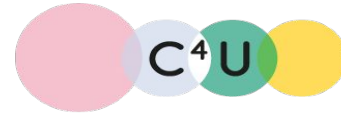
Financiado por  
la Unión Europea  
NextGenerationEU



MINISTERIO  
DE CIENCIA  
E INNOVACIÓN



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 884418.



# Gracias