

CALEF

SisAI Project



WP6 - WP6 - CO₂ looping in the SisAl process and the use of SisAl slag for CO₂ capture

Partnership

1. CALEF – (ENEA . Walter Tosto SpA)
2. RWTH Aachen;
3. Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (Fraunhofer)
4. Elkem AS Technology Kristiansand

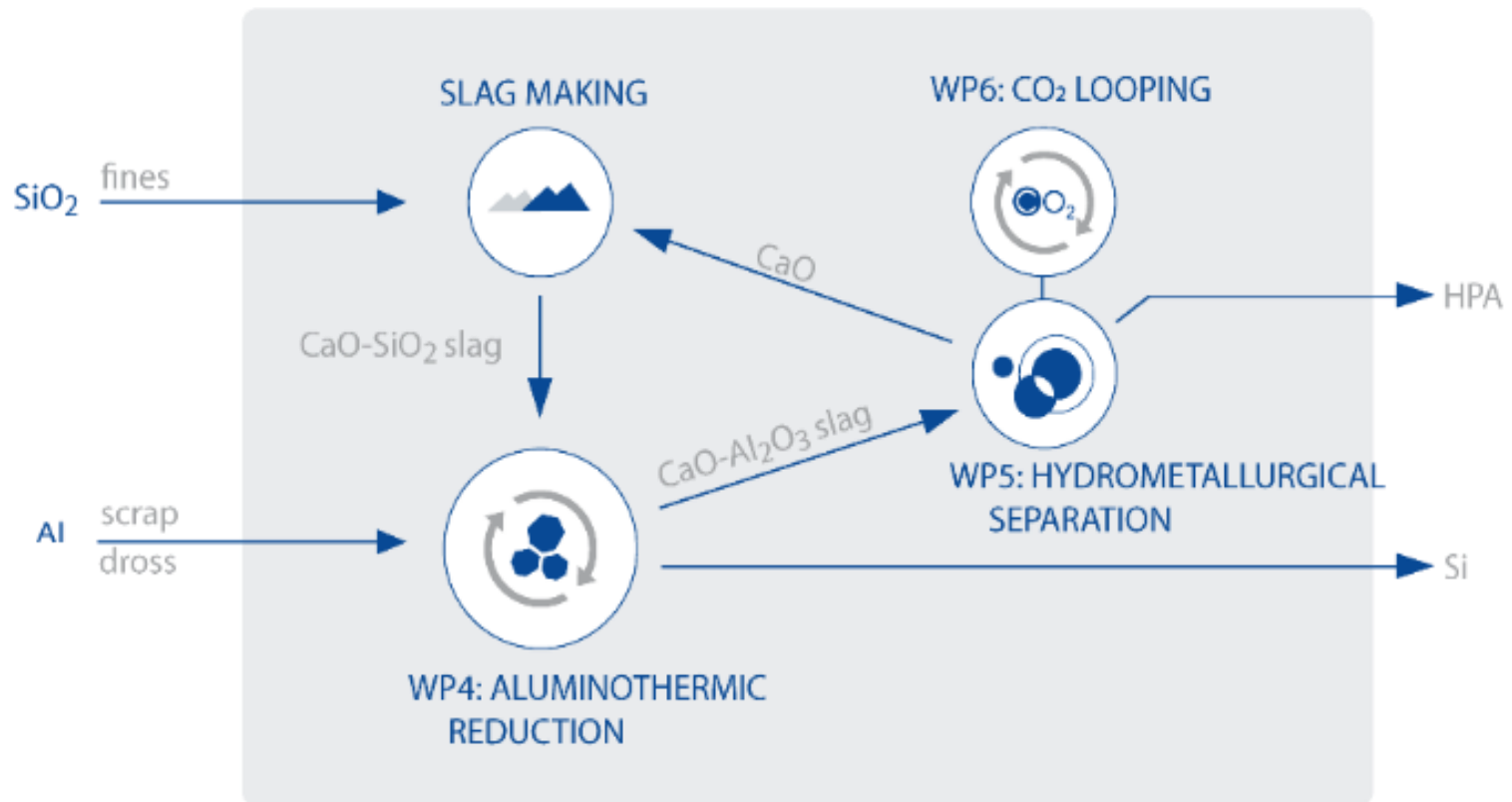
Three years 01/04/2021-31/03/2024 activities

SisAl. SisAl Slag Valorisation

Proposal Number
 20255

Lead Partner
 Norwegian University of Science and Technology (NTNU)

WP6 - CO₂ looping in the SisAl process

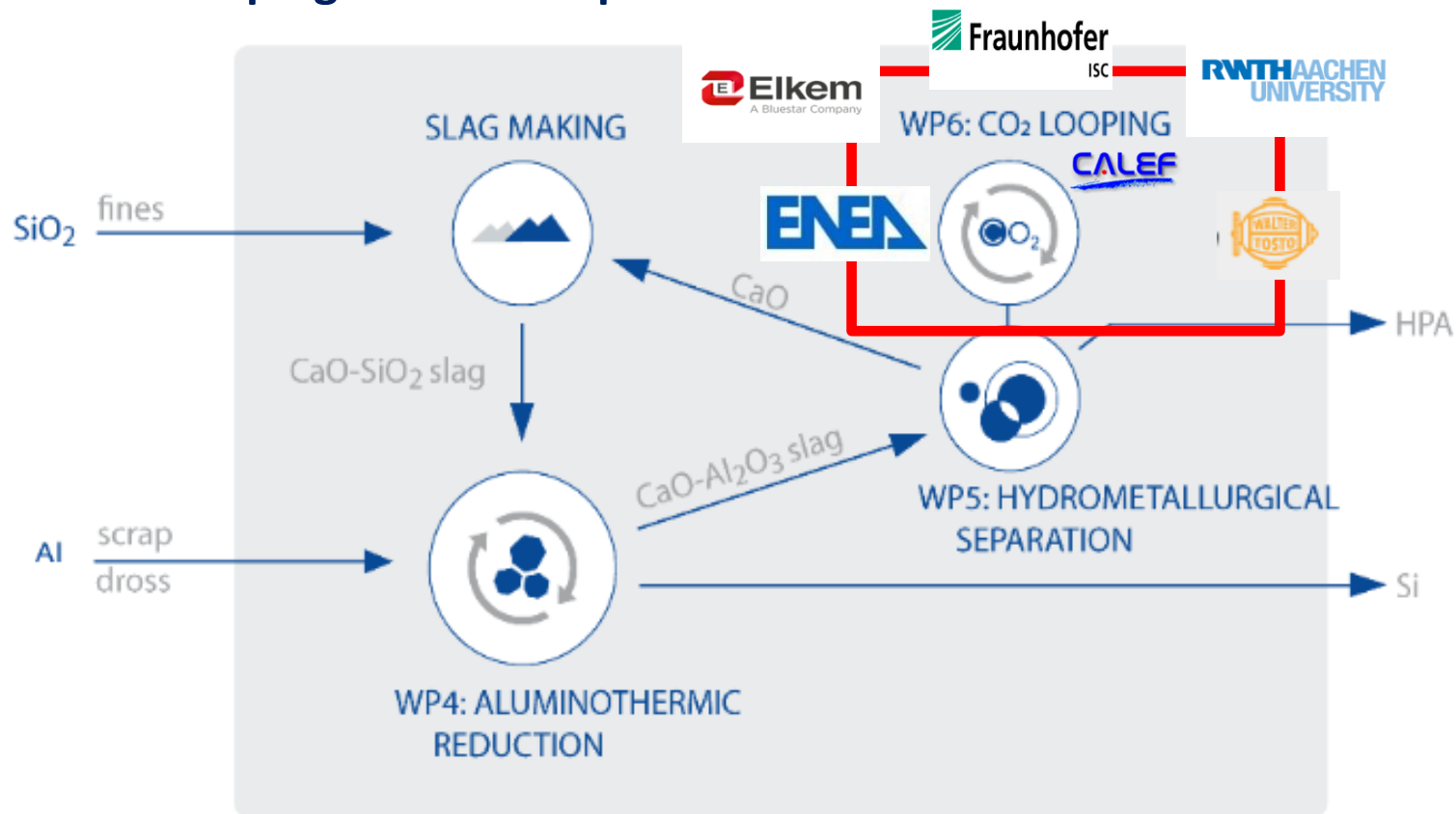


SisAl. SisAl Slag Valorisation

Proposal Number
 20255

Lead Partner
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WP6 - CO₂ looping in the SisAl process



WP6 - CO2 looping in the SisAl process and the use of SisAl slag for CO2 capture

2021

- Task 6.1: Design of Calciner (CALEF)
 - Deliverable D6.1: due date 31.XII.2021 (CALEF)
- Task 6.4: CO2 capture in high-pressure autoclave: process parameter verification (RWTH)
 - no deliverable in 2021

2022

- Task 6.2: Materials procurement, system engineering and building of Calciner (CALEF)
 - Deliverable D6.4 – due date 31.XII.2022 (CALEF)
- Task 6.4: CO2 capture in high-pressure autoclave: process parameter verification (RWTH)
 - no deliverable in 2021 but “at least” a Report with CCS reactor tests finalised

2023

- Task 6.3: Field testing (CALEF)
 - Deliverable D6.5 – due date 31.XII.2023 (CALEF)
- Task 6.5: Pilot scale CO2 capturing in high-pressure autoclave (RWTH)
 - Deliverable D6.2 – due date 31.XII.2023 (RWTH)

2024

Reporting and field tests

2021: D6.1- Mobile CO2 looping reactor design concept finalised;

2022: D6.4- Commissioning of CO2 looping reactor finalised

2022: Report no Deliverable on CCS reactor tests finalised

2023: D6.5- CO2 looping reactor tested;

2023: D6.2- CCS reactor tests finalised and reported.

2024: final report

The SisAl “Slag Valorization” project is focused on two integrated targets and related processes:

1. The recovery of metallic Si from aluminum alloy scraps
2. The recovery of atmospheric CO₂ by means of a "calcination reactor" to produce inert compounds useful for the cement industry.

The second line impacts WP6 with further two «sub-processes»:

- A) CALEF + ENEA + Walter Tosto SpA will realize, in an economically advantageous way, a calciner pilot-plant, which can be mounted on trucks, based on experience developed in ENEA CASACCIA on prototype scale.
- B) RWTH and ELKEM will develop a further Carbon Capture and Utilisation (CCU) process. This process is connected process to the “CALEF looping system” to minimise the final CO₂ emission. This last loop is based on the reaction of CO₂ with sodium-, calcium-, magnesium- or iron-containing phases to form the respective carbonates or hydrocarbonates.

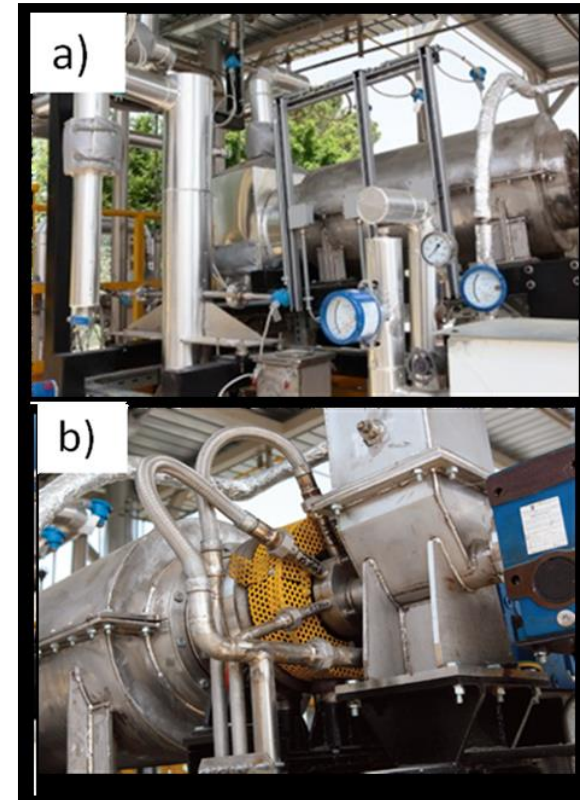
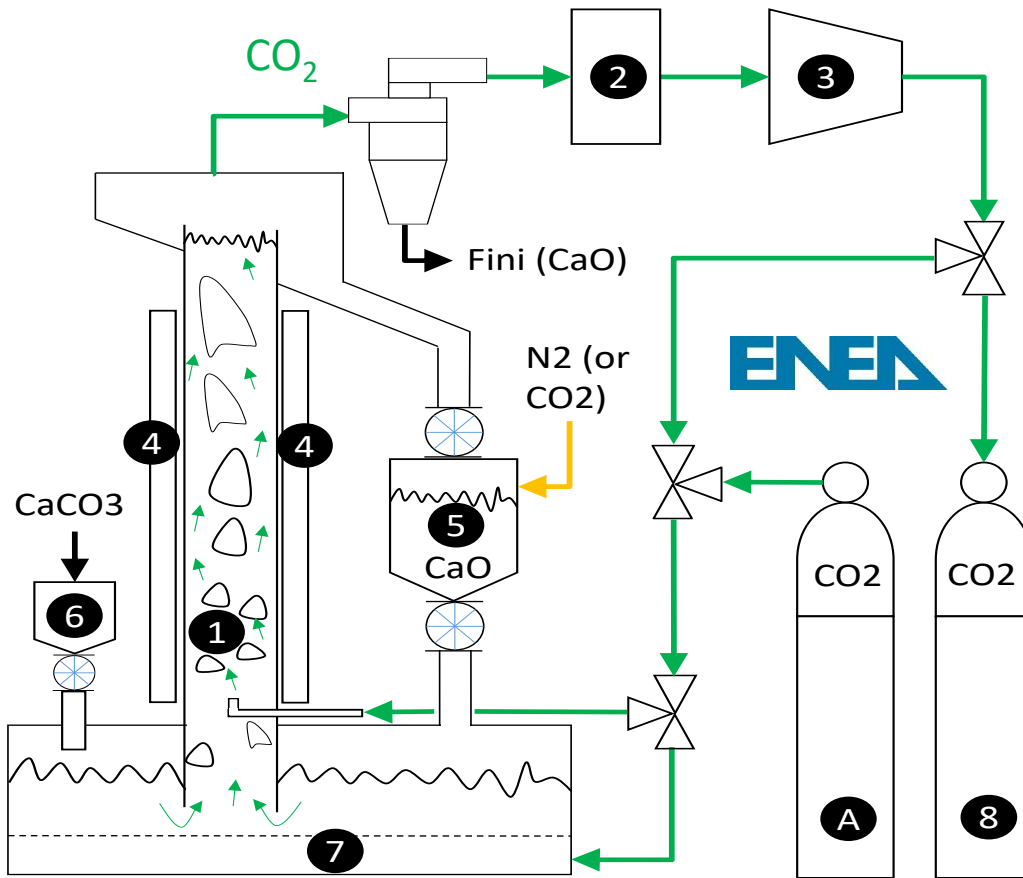


Figure: Part of calciners demo in ZECOMIX at ENEA (starting TRL5 for looping) a) Rotary drum reactor; (b) system for the injection of CO₂ and steam

Calciner Pilot Plant Scheme



Captions:

1. Calcinator (T = 920-950 ° C; P = 1 atm)
2. Ceramic filters for the further elimination of trapped dust
3. CO₂ compressor (Pout = 8-10 atm)
4. Heater (Tmax 1000 ° C)
5. CaO storage tank under pressure (P = 8-10 atm)
6. CaCO₃ supply (possibly through the tank (5))
7. Wind box
8. CO₂ storage tank

The solid to be recirculated is a granular material based on CaO with distribution of diameters 400 - 800 microns. The calciner will have a diameter between 80-120 mm while the height could vary between 1800 - 2200 mm. These and other quantities will be the subject of simulations to be carried out in the project. The tank (A) may be needed to support the compressor. The CO₂ released by the CaCO₃ decomposition is collected in the tank

Figure: Calciners demo Concept

END