This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654663, SOLPART project.

High Temperature Solar-Heated Reactors for Industrial Production of Reactive Particulates, SOLPART

www.solpart-project.eu

Starting date: 01.01.2016

Call LCE-02-2015: Developing the next generation technologies of renewable electricity and heating/cooling

Renewable Heating and Cooling: Solar heating for industrial processes

SOLPART High Temperature Solar-Heated Reactors for Industrial Production of Reactive Particulates

SOLPART Project Objective

Develop, at a pilot scale, a high temperature (800–1000 °C) 24 h/day solar process suitable for particle treatment in energy intensive non-metallic minerals' industries.

SOLPART Project Concept

Supplying totally or partially the thermal energy requirement for $CaCO_3$ calcination by solar heat, which is 60% of the total required energy in a cement plant and 100% in a lime plant.

Examining similar thermal applications for other non-metallic minerals, e.g. dolomite, phosphate, kaolinite, and others.

Expected Results and Impact

➢ Demonstrate a **pilot scale solar reactor** (about 30 kW_{th}) suitable for calcium carbonate decomposition and cement raw meal calcination (calcination reaction: $CaCO_3 = CaO + CO_2$).

➢ Simulate at prototype scale a 24 h/day industrial process (TRL 4–5) thereby requiring a **high temperature (about 900 °C) particle transport and storage system**.

• Reduce the CO_2 emission by 40% in the lime and cement industry and by 100% if CO_2 capture and sequestration is applied. Inject 60% solar energy in cement processing.

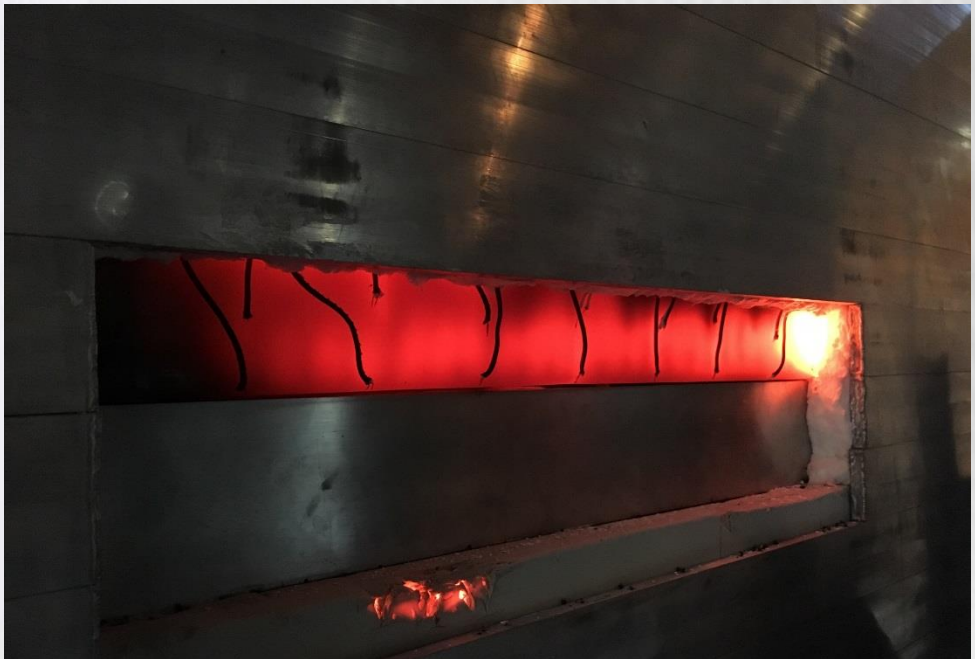
• Develop a solar technology able to treat particles to about 900 °C and apply it to various minerals.

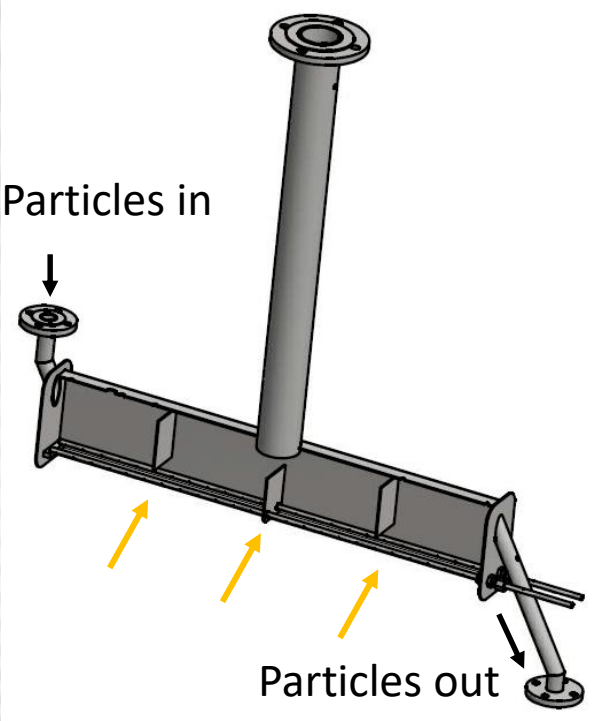
SOLPART Project Partners

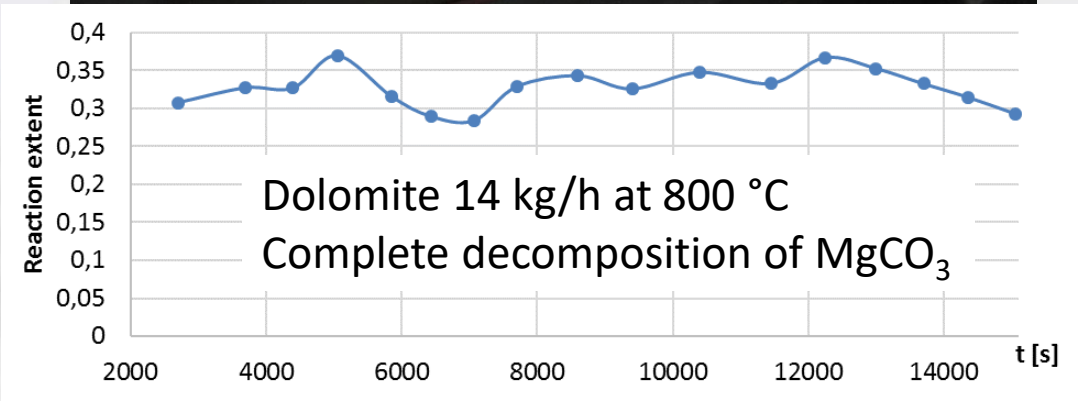
Participant No *	Participant organisation name	Short name	Organization type	Country
1	Centre National de la Recherche Scientifique	CNRS	Research organization	FR
2	CEMEX	CEMEX	Industry	CH
3	Deutsches Zentrum für Luft- und Raumfahrt EV	DLR	Research organization	DE
4	Abengoa Research	ABENGOA	Industry	SP
5	University Manchester	UMAN	High education	UK
6	European Powder & Process Technology	EPPT	SME	BE
7	COMESSA	COM	SME	FR
8	EURONOVIA	EURONOVIA	SME	FR
9	New Lime Development	NLD	SME	BE
10	Université Cadi Ayyad (& OCP as third party)	UCA	High education	MA

Lab-scale Solar Reactor Development and Testing

Shallow, cross-flow fluidized bed (patent Pending)







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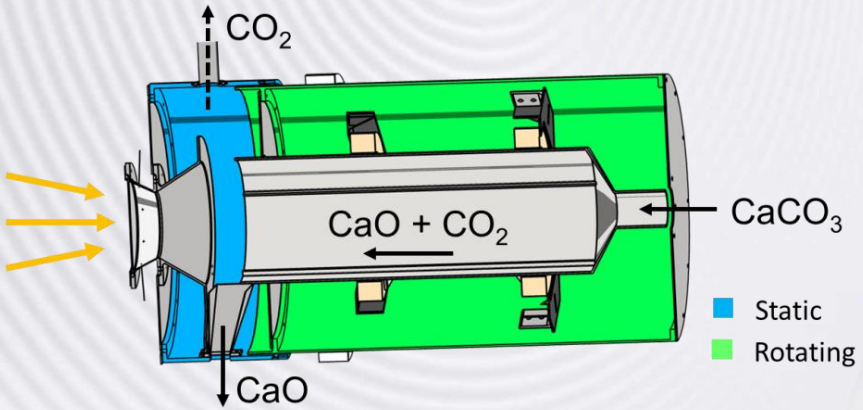
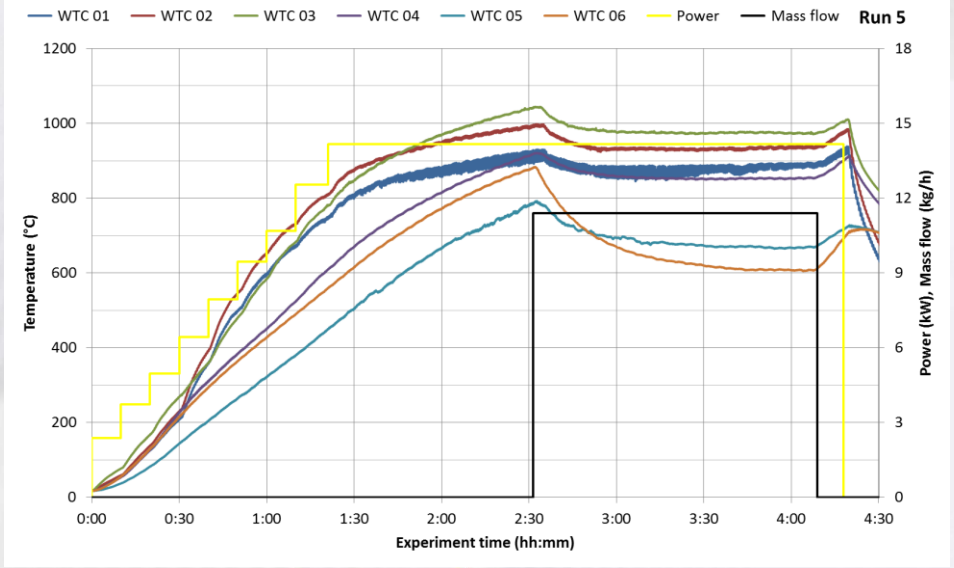
Lab-scale Solar Reactor Development and Testing

Rotary Kiln (DLR)





Cement raw meal 11.4 kg/h at 890 °C
Partial decomposition (45%) of $CaCO_3$

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Major Challenges and Barriers

➢ Develop solar reactors able to process continuously reactive particles with various size and reaction temperature.

➢ Design and test conveying and storage systems at 900 °C.

➢ Design a solar process that can be integrated in existing plants (cement, lime, phosphate).

✓ High temperature materials

✓ Residence time / reaction time

✓ Dust formation and management

→ Scale-up to MW_{th} production facility

Thank you for your kind attention

Jan Baeyens, EPPT, Solpart partner
Co-inventor of the SCfFB

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