Green Minerals

Turn CO_2 into value by using CO_2 as feedstock

Olivine reacts with CO_2 - How does it work?

Mineralization reaction of Green Minerals:

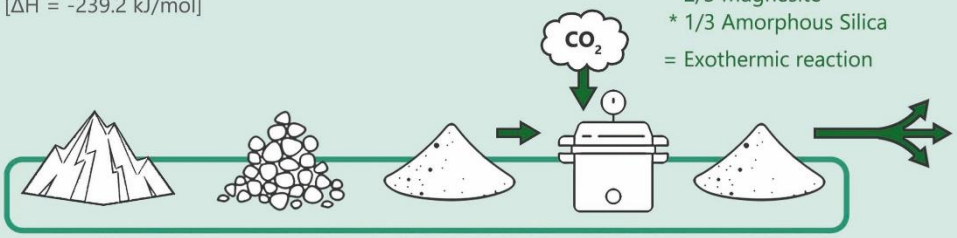
Mg_2SiO_4 (olivine) + $2CO_2$ => $2MgCO_3$ + SiO_2

[ΔH = -239.2 kJ/mol]

Mineral CO_2 additive contains very small particles

* 2/3 Magnesite
* 1/3 Amorphous Silica

= Exothermic reaction



Olivine rock = Green Mineral

Crushing

Ground olivine

Ground olivine reacts with CO_2

Mineral CO_2 additive: $MgCO_3$ + SiO_2 = 1/3 CO_2

CONCRETE

PAPER

POLYMER

Reduce & Reuse CO_2

Green Minerals is a process which a factory can integrate within its current production process: capturing CO_2 and add the 'mineral CO_2 additive' to its resources, materials and products. A circular manufacturing process, producing CO_2 based materials.

CO_2 based materials

Concrete, plastics and paper are three examples of Green Minerals applications, in which CO_2 is captured and permanent stored in materials. Mineral CO_2 additive can be approached as useful addition or replaced filler to improve properties.

Partners

Brightlands Innovation Factory facilitates to start-up

Creative assistance: communication & design by **Regeneration Design**

Process- and knowledge exchange with **SCW Systems**, clean energy technology

Brightlands Innovation Factory

Regeneration

SCW Systems

Imagine...

...living in this house built with CO_2

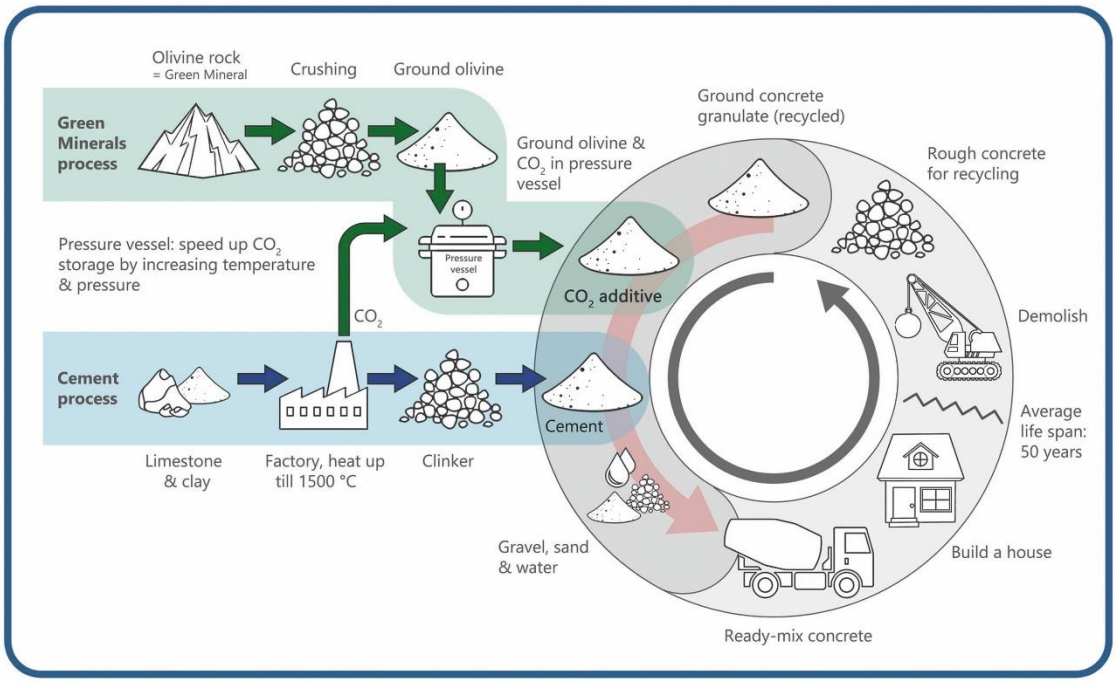
...sitting on this chair produced with CO_2

...reading this book made with CO_2

CO_2 Concrete

Functional filler to increase packing density

How to reduce & reuse CO_2 in the construction industry



Opportunities

3D printing - First prototype & testing

Enhancing material properties in **conventional concrete** as well as enabling **new cementitious binder concepts**

For even further reduced carbon-footprint of **recycled concrete**

As precursor in **geopolymer concrete (GPC)**

Partners

RWTH AACHEN UNIVERSITY

HEIDELBERG CEMENT

DELTA CONCRETE CONSULT

CO_2 reduction with geopolymer concrete

GPC is another name for Alkali Activated Cementitious Material (AACM)
The technology is a logical extension of conventional concrete

Why:

Less CO_2 emissions by increased versatility of types of raw materials

Increased suitability towards locally available- and circular feedstocks

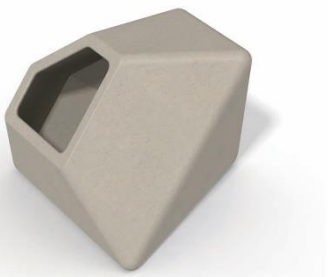
Enhanced technical properties of the concrete in respect to acid-resistance, abrasion-resistance and fire-resistance

How:

2 components-binder system technology: Precursor + Activator

Chemical reaction:
polymerization instead of hydratation yielding CASH instead of CSH

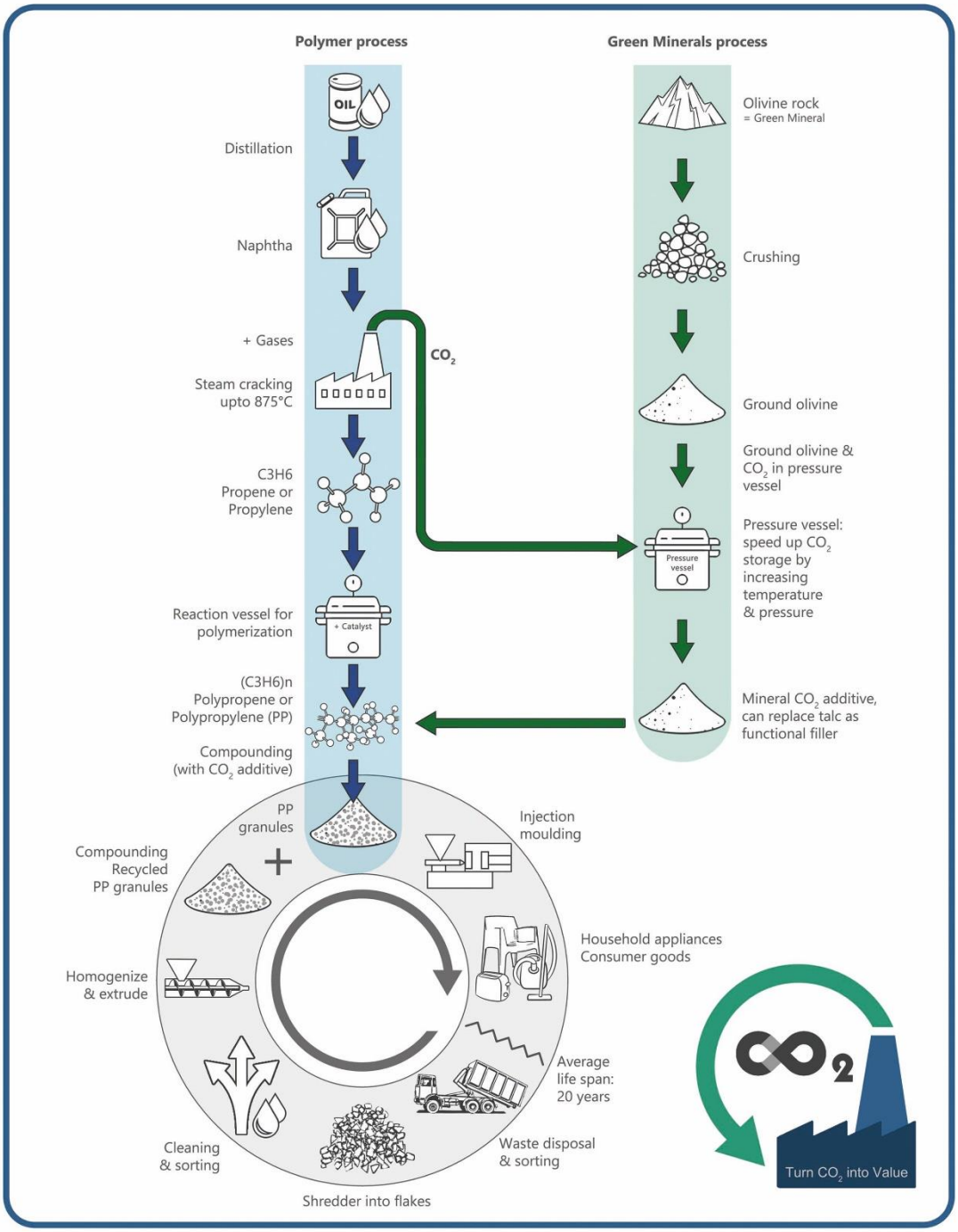
Processing of GPC is the same as conventional concrete;
the same machines & tools can be used



CO_2 Plastic

Replacement of talc as functional filler

How to reduce & reuse CO_2 in the polymer & plastic industry



Opportunities

3D printing - First prototype & testing

Replacement of **talc / wollastonite** in polymers like PP, PE, PVC, ABS & thermosetting compounds

Biobased polymers + CO_2 based fillers

Recycling industry

Partners

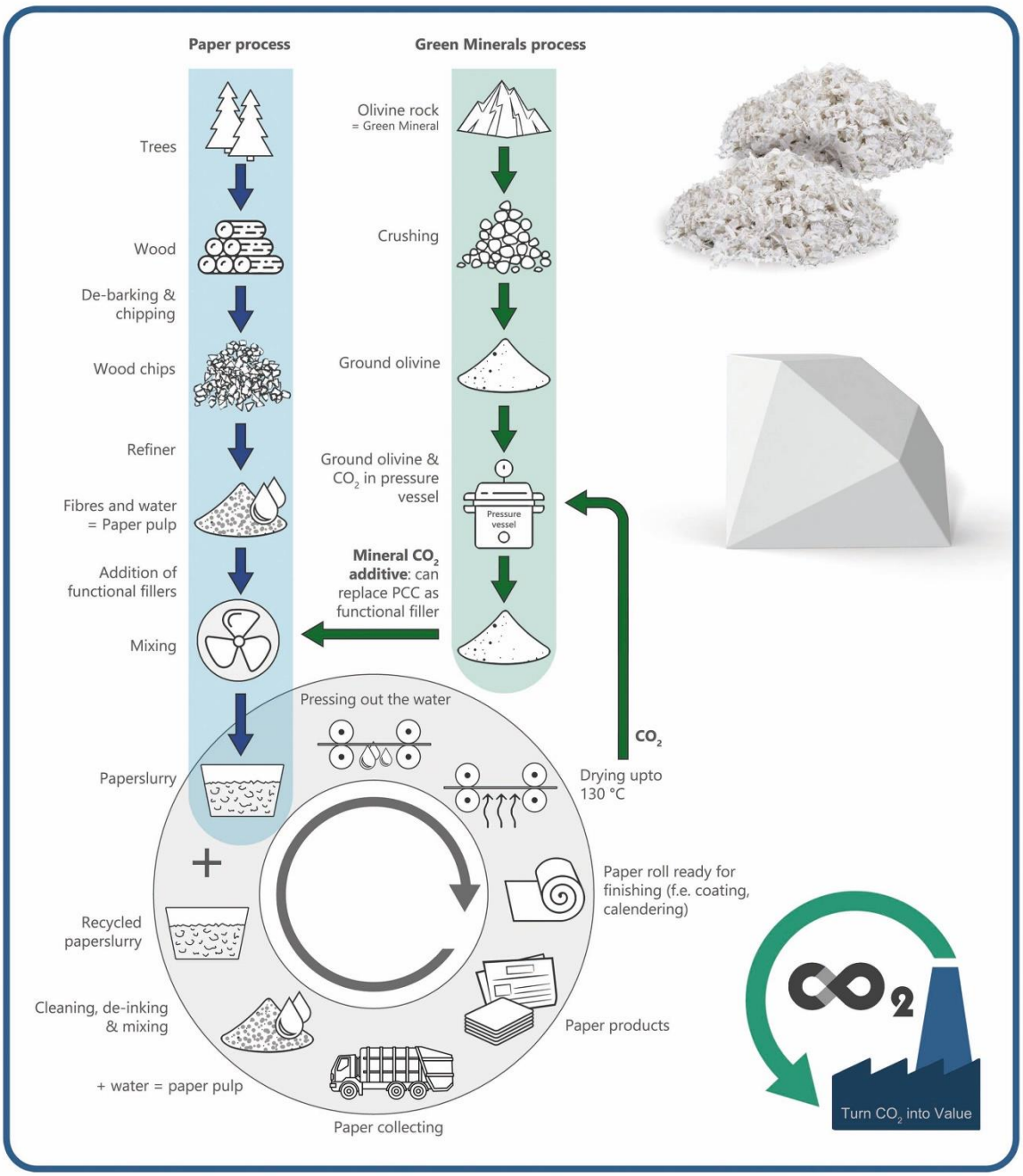
Chemelot Innovation and Learning Labs

Maastricht University

CO_2 Paper

Replacement of PCC as functional filler

How to reduce & reuse CO_2 in the paper industry



Opportunities

Replacement of **Precipitated Calcium Carbonate (PCC)**
PCC is used for producing **high quality paper and paperboard**, but requires an energy intensive making process.
Mainly 1/3 PCC is used in paper = approx. 16% CO_2 in paper

Paper sludge can be used to convert to Green Gas & CO_2
Use this CO_2 to make '**CO_2 negative paper**'

Add 'Mineral CO_2 additive' in the **recycling** process

Partners

KCPK
KENNISCENTRUM PAPIER EN KARTON

TECHNISCHE UNIVERSITÄT DARMSTADT

About us

History

Green Minerals was founded in 2011 by Pol Knops, a physicist who has been doing research of CO_2 storage by mineralization for 8 years. The goal was initially to capture CO_2. The project became more interesting when Pol discovered that particular products with a functional application could be made.

Stage

We are searching for sustainable, **long-term partners**.
To **co-develop** and **validate** the beneficial use of CO_2 based materials in the **various markets**.

The product is 2/3 Magnesite and 1/3 Amorphous Silica, it consists of **very small solid particles** with beneficial use in **paper, polymer and concrete**. We are eager to validate the use in various applications in the supply chain.

Contact

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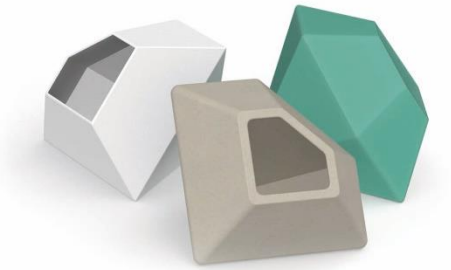

Green Minerals

www.green-minerals.nl

Design | Visuals | Infographics | Lay-out

Regeneration Design assists scientists and companies with clarifying their technology or idea by design, visualization and storytelling so the innovation will faster find its way to the market.

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Innovation that leads to
Regeneration
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