Rijksdienst voor Ondernemend Nederland

CO_2 capture and storage by mineralisation

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CO_2 Capture and Storage by Mineralisation

Application:
substituting existing materials like sand, gravel, a.o.

Possibilities:
prepared minerals, e.g. olivine,
leading to **permanent storage of CO_2:**

1. **Natural binding**: using (milled) minerals in open applications
2. **Accelerated binding**: prepared (and milled) minerals as substitute/building part in existing applications

CO_2 Capture and Storage by Mineralisation **natural**

Natural binding:

- Slow proces leading to long-to-live cases
- Particle size is discussion item (CO_2-acceptance against loss by wind in open situations)
- Business cases exist already as bulk substitutes; examples are walk pathes next to railroads, greenery pathes
- Prepared material on sale at low quantities
- Carbon price is no issue, product price is decisive and depends on the substitute/application
- Research ongoing around North Sea

CO_2 Capture and Storage by Mineralisation, **accelerated (1/3)**

Accelerated binding:

- CO_2 can react with a range of minerals to form carbonate minerals, like calcite or magnesite.
- Use includes pharmaceutical feedstocks and building materials like aggregate.
- In some cases, CO_2 becomes a new or substitute feedstock in the concrete production process; in other cases, CO_2 is used to cure or process cement.

CO_2 Capture and Storage by Mineralisation, **accelerated (2/3)**

Accelerated binding:

- Prepared mineral by controlled process conditions (P, T), preferable by autoclave
- Exotherm process, reacting CO_2 with minerals brings efficiency (only process starting energy needed)
- Combination with capture plant
- Both bulk production (kton/yr) as niche ones (kg/batch)
- Carbon price is only a minor issue, product price regulates the market application
- International research is ongoing and growing, TRL from 2 to 4

CO_2 Capture and Storage by Mineralisation, **accelerated (3/3)**

- **Netherlands** developments:
  - Milled olivin + CO_2 at 100 bar/180°C (15 – 60 min depending on particle size) -> **Green Mineral**
  - Building stone produced in smaller quantities by commercial building company (RuwBouwGroep)-> **'Compensatie steen'**
- **Germany**: project "**CO2MIN**" (HeidelbergerCement, RWTH Aachen, a.o. GreenMinerals/NL)
- **UK**: **Carbon8 project** (3 full scale production facilities); CO_2 is used to treat thermal wastes to building aggregates
- More coming

Solidia Technologies

30 Solidia Concrete™ blocks will absorb 22 kg of CO_2 at production.

In one year, a tree will do the same.

So, how much CO_2 could **Venice** absorb…?

Solidia Technologies® is a cement and concrete technology company offering patented processes that ease production, reduce costs, and improve performance of cement and concrete, while reducing the carbon footprint of concrete up to 70% and water consumption 60-80% during manufacturing.

Easy to adopt anywhere in the world, the technologies produce a sustainable cement and cure concrete with CO_2 instead of water, while utilizing manufacturers' existing infrastructure, raw materials, formulations, production methods and specifications. Stronger, more durable and higher performing than traditional concrete, Solidia Concrete™ products cost less to produce, reduce water and energy use, and cure in less than 24 hours.

Cement is a crucial raw material in the production of concrete: 4 billion tons are produced globally per year, resulting in US$300 billion global market. Concrete is the second most utilized substance on the planet after water: approximately 33 billion tons are produced globally per year. The combined market value of cement and concrete worldwide is US$1.3 trillion. Currently in commercialization, Solidia creates value along the entire global supply chain.

COMBINED, THE PRODUCTION OF
SOLIDIA CEMENT™ & SOLIDIA CONCRETE™
REDUCES THE CARBON FOOTPRINT OF
CONCRETE UP TO 70%,
FUEL CONSUMPTION BY 30%,
& WATER USE UP TO 80%.

CO_2 Capture and Storage by Mineralisation **Conclusions**

- Open application of prepared minerals has niche possibillities
- Application of prepared minerals with CO_2 seems to have market opportunities (energy efficiency, better properties of end product, controlled “storage”)
- There is a lot to do still, but encouraging developments are on the way (TRL 2-4, though some are already on/close to market)
- **Nevertheless-1**: it is too early to start a TF on Mineralisation
- **Nevertheless-2**: regarding developments – also in other “CO_2-consumptive processes – it would be good to review the “consumptive” part of the earlier non-EOR Utilization Options
- Doing so, this would bring a further input for the TRM update


Grazie mille !