CO₂ capture and storage by mineralisation

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CO₂ 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 CO₂:

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 process 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 paths next to railroads, greenery paths
- 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
CO₂ Capture and Storage by Mineralisation, accelerated (1/3)

Accelerated binding:

- CO₂ 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, CO₂ becomes a new or substitute feedstock in the concrete production process; in other cases, CO₂ 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
So, how much CO₂ could Venice absorb...?
CO$_2$ Capture and Storage by Mineralisation

Conclusions

• Open application of prepared minerals has niche possibilities
• 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 !