



Carbon
Upcycling
Technologies

The Waste of Today, **Building Tomorrow**

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 @CarbonUpcycling

Problem



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40%
from *Buildings*



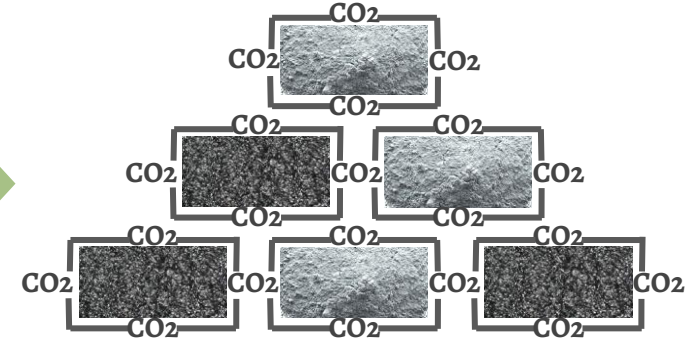
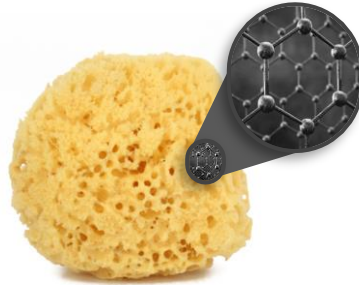
2X
sqft of built environment by 2060

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Solution



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Graphite

OR



Fly Ash

OR

Other SCMs:

- Talc
- Kaolin
- Steel Slag
- Glass

3 patents covering 10 countries
(including EU bloc)

1 platform technology to produce fine
additives for 11 industries



Coatings



Concrete



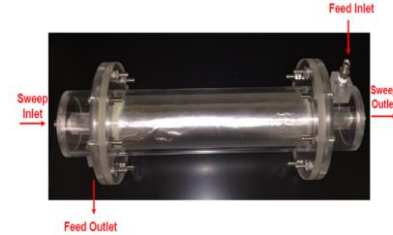
- Increases concrete compressive strength by up to 40%
- Reduced cement consumption



Polymers



CO₂ Capture Membrane

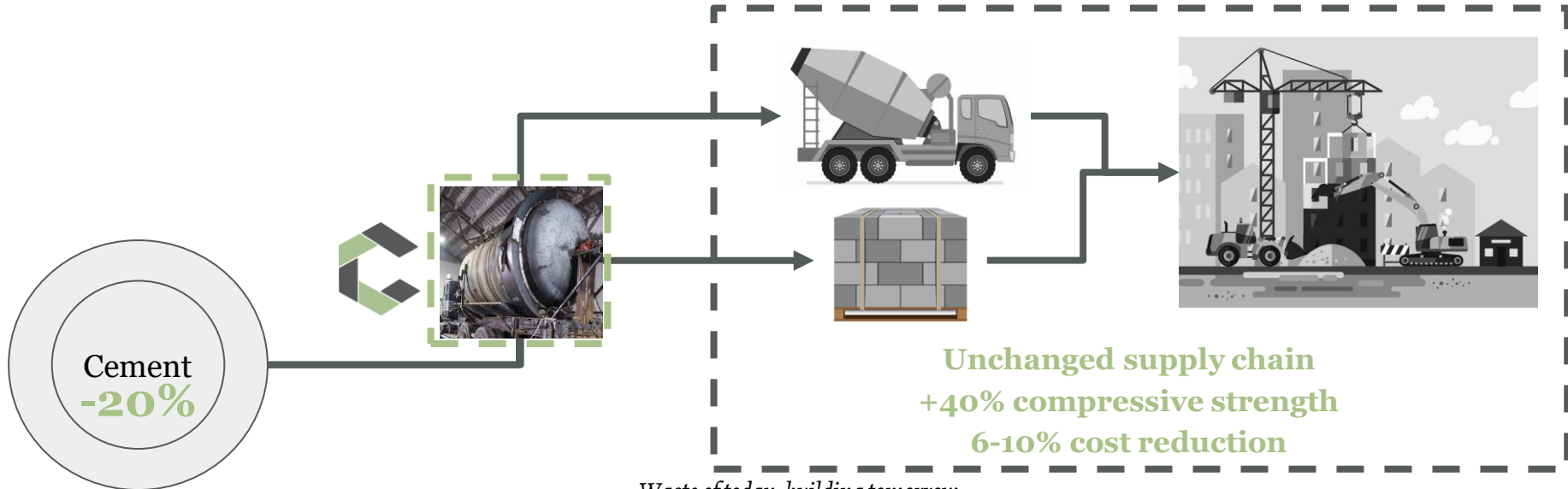


Competitive Advantage



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- Low energy carbon utilization process
- Production at non-peak electricity hours
- Reduced cement by up to 20%
- 5-15% CO₂ sequestered by mass of end-product
- Renewable energy grid
- Compatible with other additives and tech



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Progress



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Alpha: 50 g

Beta: 200 g

Gamma: 1 kg

Zeta: 1 tonne

Eta: 15 tonne



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Commercial Progress



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Case Studies:

- Continue to see improved strength gains
 - Additional **cement reduction**
 - Over **20% strength improvement**
- LCA Validated - **Carbon Negative Technology**



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Demonstration Site



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- NRG COSIA Carbon XPRIZE
- Concentrate CO₂ from point source emissions
- Scalable process that can be deployed at energy distribution locations
- Sold to local Ready-Mix Concrete Plant

Shepard Energy Centre, Calgary - Combined Cycle Natural Gas Power Plant

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Products & Markets

Coatings



Concrete



Polymers



CO₂ Capture Membrane



Capture Membrane Testing

Previous Testing:

- Developed by Ohio State University
- Testing completed: National Carbon Capture Center (NCCC)
 - Alabama, USA
- Testing completed: Carbon Management Canada Research Institutes (CMC RI)
 - BC, Canada
- Integrated CCU Testing soon to commence: Alberta Carbon Conversion Technology Centre (ACCTC)
 - Alberta, Canada



Results

Flux (GPU):

1,100

CO₂/N₂ Selectivity:

100-200

Optimal Temperature (C):

50-60

International Traction



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- Recently announced partnership
- Looking to beneficiate more industrial wastes

IMPACT:

- Reduction of cement
- SCM beyond fly ash



- Soon to engage on H2020 project
- CCU for international cement company

IMPACT:

- Commercial demonstration of reducing on-site CO2 emissions, and embodied carbon of concrete



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