UPCYCLING CO_2 IN A NOVEL CONCRETE

Utilizing CO_2 and industrial byproducts to create CO_2-negative upcycled concrete that performs as well, or better, than traditional construction materials

NEW, VALUE-ADDED PRODUCT

Flue gas-borne CO_2 and repurposed abundant industrial wastes, such as crystalline slags and fly ash, can be used to create "upcycled concrete." This value-added product **provides the coal power industry with a viable path to significantly reduce its carbon emissions.**

The "upcycled concrete" production process also **minimizes external energy needs** by fully utilizing low-grade heat sourced from the flue gas, which **decreases operating costs.**

EXAMPLES OF INDUSTRIAL WASTE FEEDSTOCKS

Basic oxygen furnace slag

Co-mingled steel slag

UPCYCLING PROCESS OUTCOME

Cylindrical mortar specimens

LOWER NET CO_2 EMISSIONS FROM COAL

- **Upcycling industrial wastes and CO_2** uses coal combustion and metal processing wastes (slags) as precursors for scalable CO_2 mineralization.
- **Process design** integrated solution incorporates aspects of calcium leaching, portlandite ($Ca(OH)_2$) precipitation, mixture formulation, and structural shape stabilization—while maximizing CO_2 uptake.
- **Ordinary Portland Cement (OPC) concrete replacement** is a novel CO_2-negative upcycled concrete that performs as well as or better than standard OPC-based concrete.

QUICK FACTS

AWARD NUMBER
DE-FE0029825

PROJECT BUDGET

FY18 FUNDING

$1.35M

DOE	$1,000,000
UCLA	$350,000

CONTACTS

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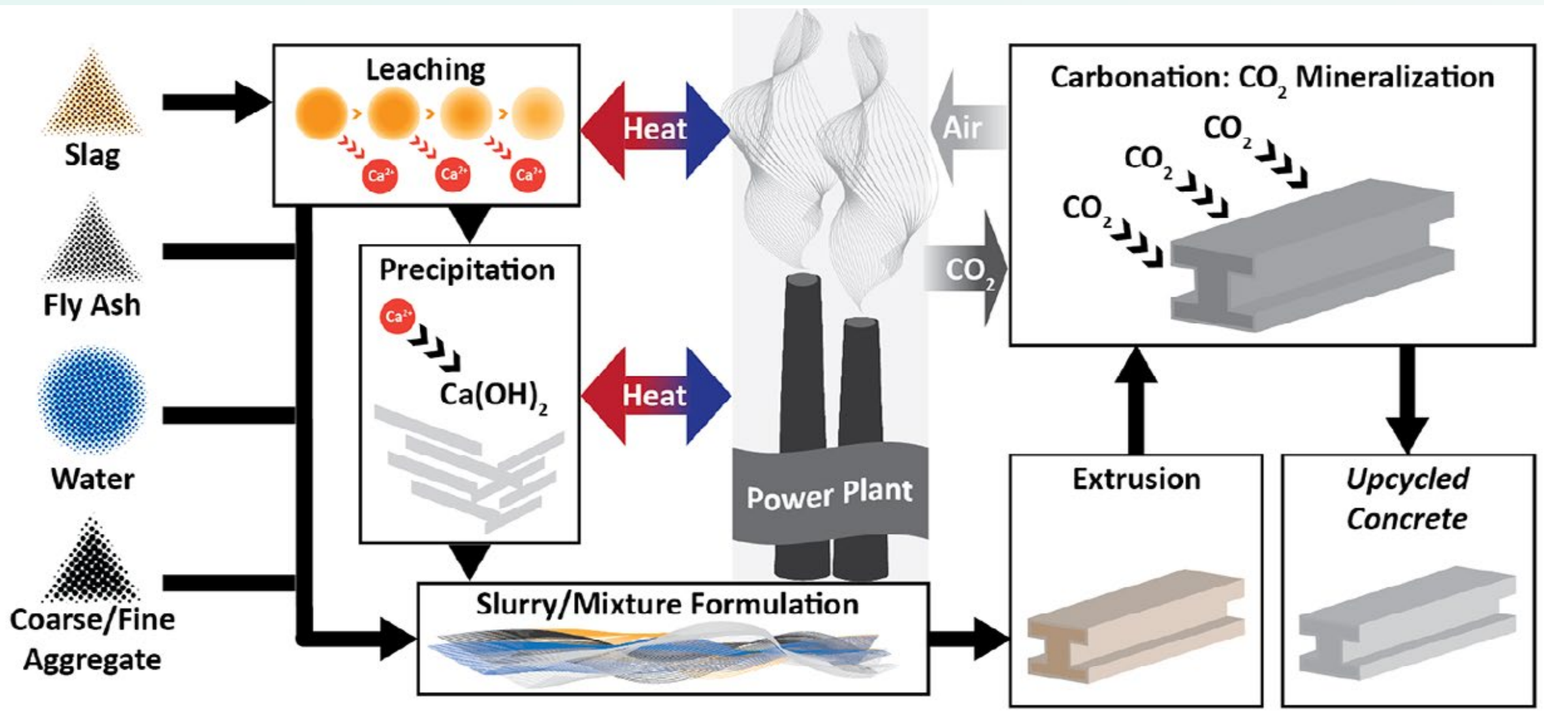
INTEGRATED TECHNOLOGY PRODUCTION PROCESS



- Results indicate the **upcycled concrete process yields a construction material** with a CO_2 uptake >6% by mass and strength development from carbonation.
- **Results confirm direct evidence of low-temperature portlandite synthesis from slags.**

2018 Science & Technology ACCOMPLISHMENTS SESSION

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