DAC CO_2 to Concrete

CarbonCure + Heirloom

2024 Innovative Partnership Awardee

In October 2023, CarbonCure Technologies and Heirloom finalized an agreement through at least 2025 to store atmospheric carbon dioxide (CO_2) captured by Heirloom's Direct Air Capture (DAC) technology in concrete using CarbonCure's carbon mineralization technologies. This collaboration builds on a successful demonstration in early 2023 of this DAC-to-concrete storage pathway. In February, a historic milestone was achieved when Heirloom, CarbonCure and Central Concrete showcased the first-ever capture and permanent embedding of DAC CO_2 from the atmosphere in concrete. CarbonCure's Carbon XPRIZE-winning Reclaimed Water Technology was employed to store CO_2 in concrete supplied to San Jose construction projects. The process ensures CO_2 remains sequestered, even if the concrete is demolished.

The agreement between these two carbon removal companies extends learnings from the earlier demonstration project to store CO_2 captured by Heirloom's newly opened commercial DAC facility in Tracy, CA, leveraging CarbonCure's proven and verifiable concrete storage solution. Fully powered by renewable energy – supplied locally by Ava Community Energy – Heirloom's DAC technology uses limestone to extract CO_2 in a cyclic process, with captured CO_2 either stored underground or embedded in concrete. The capacity of Heirloom's limestone-based technology to capture CO_2 from the air has gone from 1 kilogram of CO_2 to up to one million, or 1,000 metric tons, in just over two years. Meanwhile, CarbonCure's technologies, licensed to nearly 800 concrete plants across 35 countries, mineralize CO_2 during the concrete manufacturing process. This not only permanently embeds CO_2, but also reduces carbon emissions, freshwater usage, and waste material in concrete production. To date, CarbonCure's global network of industry partners has produced more than 6.6 million truckloads of carbon mineralized concrete, resulting in the removal and reduction of more than 425,000 metric tons of

CO_2 – equivalent to removing more than 100,000 gas-powered cars from the road for a year.

With the supply of atmospheric CO_2 rapidly scaling through the deployment of direct air capture (DAC) and other innovative CO_2 capture technologies, concrete provides a globally deployed, accessible storage solution with massive capacity: An estimated 35 billion metric tons of concrete are poured around the world annually. Until more permitted Class VI wells become operational for geologic storage, Heirloom and CarbonCure's unique collaboration overcomes this barrier to innovation and climate action while, notably, also supporting reductions of hard-to-abate emissions from the concrete industry. Moreover, the ability to move forward with real-world deployments that permanently sequester CO_2 demonstrates proactive leadership. By supplying carbon-mineralized concrete to construction projects in California, CarbonCure and Heirloom are showcasing a tangible and scalable solution that addresses the urgent need for carbon removal as well as sustainability in the construction sector.

Besides water, concrete is the most-used substance in the world. But cConcrete's key ingredient – cement – is carbon-intensive, accounting for an estimated 7% of the world's CO_2 emissions. That is three times the emissions of global aviation. With carbon mineralization, concrete's carbon footprint is reduced in two ways: 1) As the concrete is manufactured, captured CO_2 is injected into the concrete or concrete waste water. The CO_2 immediately reacts with the cement and mineralizes. 2) This carbon mineralization maintains the compressive strength of the concrete and enables a reduction in cement, producing the same high-quality concrete with fewer carbon emissions. This cement reduction also reduces manufacturing costs, helping producers to cover the technology's licensing costs and sell the lower carbon product with little or no green premium.

Concrete producers who use these technologies are able to establish themselves as sustainability leaders in their communities and differentiate themselves from competitors. And with the ability to bid on and win more sustainable building projects, both private sector and government funded construction, concrete producers are rewarded for their embrace of sustainability. These economic benefits advance and accelerate our green transition without hurting businesses, workers or their incomes.

The collaboration between CarbonCure Technologies and Heirloom ensures lasting impact through the inherent benefit of centuries-long CO_2 mineralization in concrete. Meanwhile, the agreement through 2025 signifies a commitment to long term

collaboration, fostering continuous innovation and technology integration. Demonstrated scalability in the DAC-to-concrete storage pathway allows for replication in diverse settings across the Global North and South, contributing to a sustained, widespread influence. This collaborative approach, emphasizing innovation and scalability, positions this carbon removal pathway for ongoing success in the dynamic landscape of carbon removal and lower carbon concrete manufacturing.

This collaboration between CarbonCure and Heirloom is evidence that carbon removal is real and rising in scale, and that collaboration among CDR companies can really boost innovation, deployment, and - most importantly - climate impact. The DAC-to-concrete storage pathway for atmospheric CO_2 enables Heirloom to scale its DAC technology through an immediately-available, permanent storage solution with the urgency that the climate crisis demands.