

INDUSTRIAL MINERALIZATION

Repurposing Industrial Waste into Durable Climate Value

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Foreword

Making large systems work rests on a powerful art, that of process engineering. It's what turns complexity into scale. Heavy industries have spent generations building and refining this expertise to operate at planetary scale. This requires infrastructure, logistics, and abundant feedstock, the physical and material flows that keep industries running, built and operated by people who know the systems inside out.

The same infrastructure and process know-how that make industries productive can also move carbon out of the atmosphere. Carbon removal technologies are proven, but scaling them requires deployment through the very industries that already operate at that scale. **Industrial integration is, to me, the next major enabler for carbon removal.**

The case for integrating carbon dioxide removal (CDR) into industrial value chains is increasingly clear. Integration makes both strategic and business sense. It can serve as a tool for internal decarbonization, a source of new revenue through high-integrity carbon credits, and a more sustainable alternative to legacy practices. Done right, it reduces risks and builds resilience for both business and society.

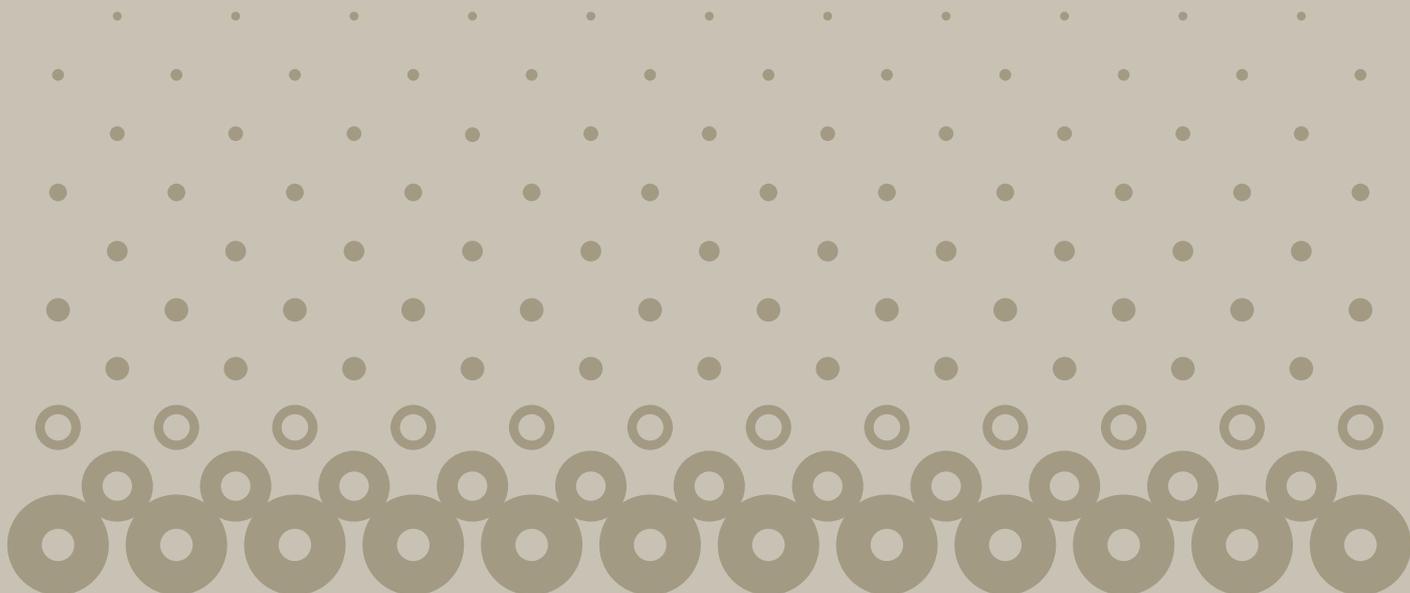
Industrial Mineralization (IMin) stands out because it fits naturally within the flow of heavy industry. It turns existing by-products into assets, linking carbon removal to the processes and expertise that already operate at scale.

This whitepaper outlines the logic behind Industrial Mineralization: how waste becomes valuable, how opportunity can be realized, and how collaboration between industries, technology providers, and policymakers can make gigatonne-scale mineralization possible. **The insights point toward a future where carbon management and circularity become industrial core competencies.**

Ultimately, this whitepaper is not about the invention of a new pathway. It's an invitation to lead and scale one, by aligning the partnerships, investments, and regulations that make large systems work for the climate, not against it.

Tank Chen
Co-founder, **CDR.fyi**

Executive Summary



The world has a tough equation to crack: Mountains of waste on the ground, and gigatonnes of CO₂ in the sky. What if two wrongs could make a right?

Carbon Dioxide Removal (CDR) is an emerging industry that permanently removes carbon dioxide from the atmosphere to stabilize the climate, through a broad range of technological pathways. Among these, IMin uses alkaline industrial waste to mineralize CO₂ into solid carbonate minerals. In doing so, IMin tackles two persistent problems: industrial waste on the ground and excess atmospheric carbon. Applicable feedstocks include alkaline waste streams from the steel, mining, cement and legacy power industries. It is a pathway to durable, gigatonne-scale carbon removal, transforming liabilities into assets and waste into value.

The difference is harnessing the scale of heavy industry. IMin plugs into industries' ability to make big systems work: process engineering expertise, logistics, infrastructure, and feedstock. This industrial integration enables carbon removal to scale to planetary impact.

IMin supports business models anchored in tangible co-benefits, such as waste stabilization, neutralization of hazardous materials, increased metal recovery, and marketable by-products,

thereby materially improving project economics. IMin also creates revenue from high integrity carbon credits that are durable and verifiable. By integrating within pre-existing industrial sites, it minimizes the requirement for additional resources whilst avoiding additional land use.

IMin can also be embedded into mine-closure and waste-management planning, capitalizing on co-benefits to reduce long-term environmental liabilities while aligning with regulatory and operational frameworks.

For mining, steel, cement and power generation, IMin is a multibillion-dollar opportunity, repurposing waste into value.

Today, IMin is a sector of startups led by teams with deep industry experience. Momentum is real, with signed partnerships and strategic investments across regions and feedstocks. In October 2025, for example, Arca announced an agreement with Microsoft to deliver approximately 300,000 tonnes of durable carbon dioxide removal over 10 years, the largest commercial IMin agreement to date.

For industry leaders, investors and governments, the message is clear: IMin is a pathway that embeds carbon removal into the economics and operations of industrial scale.