# Biochar Carbon Removal And Opportunity For Carbon Negative Concrete

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## Abstract

Among carbon dioxide removal technology, biochar offers a scalable solution that not only stabilizes carbon but also creates value-added applications. This paper explores the concept of biochar-based carbon removal and its integration into construction materials to achieve carbon-negative products. Biochar is produced through pyrolysis of agricultural residues, locking biogenic carbon into a stable form. When incorporated into cementitious systems—particularly as an additive or partial replacement in concrete—biochar provides dual benefits: permanent carbon sequestration and enhanced material properties. The highly porous structure of biochar contributes to internal curing by storing and gradually releasing water during hydration, which improves cement hydration efficiency, reduces autogenous shrinkage, and enhances long-term durability. Furthermore, the biochar surface can serve as nucleation sites for hydration products, potentially accelerating early-age strength development and refining pore structure.

We present the scientific basis of biochar carbon permanence and its function in cement hydration mechanisms. Furthermore, we examine opportunities for carbon-negative concrete, including techno-economic feasibility, environmental co-benefits, and scaling potential in regions with abundant agricultural residues. This integration of biochar into the construction sector represents a promising pathway to decarbonize materials while generating certified CDR credits, positioning biochar concrete as a cornerstone for future climate-positive infrastructure.