Researchers optimize a method using seawater that produces mineral deposits while trapping carbon dioxide

MARCH 19, 2025 - The ocean can be harnessed to absorb carbon dioxide from the atmosphere, effectively storing it in water layers and acting as a carbon sink. In research published in Advanced Sustainable Systems, investigators optimized an electrochemical method called seawater splitting for trapping and sequestering carbon dioxide into stable solid mineral deposits.

When applying voltage or current to seawater during seawater splitting, or electrolysis, hydrogen gas evolves at the cathode, while oxygen or chlorine gas is generated at the anode. Deposits of carbon-trapping minerals such as calcium carbonate and magnesium hydroxide—which have untapped potential as resources for construction, manufacturing, and environmental remediation—also form at or near the cathode.

By varying the applied voltage, current density, and carbon dioxide injections, scientists optimized seawater splitting for the purpose of carbon dioxide sequestration. The method allows for maximal mineral yield with minimal energy use, offering a promising pathway to transform carbon dioxide into useful substances.

"This work presents a scalable strategy to not only remove carbon dioxide from the environment but also upcycle it into useful solid materials for construction applications, creating a circular approach to carbon management," said corresponding author Alessandro F. Rotta Loria, PhD, MSc, of Northwestern University.

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