

Accelerated carbon sequestration from extremophilic microbes

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Greenhouse gases, such as carbon dioxide, are a major contributor to climate change and this creates a need for capture of such gases. Current solutions involve pumping captured carbon dioxide into depleted oil and gas fields. However, this runs the risk of potential leaks allowing the carbon dioxide to escape and enter the atmosphere. Fortunately, in the presence of water carbon dioxide dissociates into carbonate ions which then reacts with calcium ions to form stable calcium carbonate. It is thought that process can be accelerated through the use of microbes specifically ones that produce the enzyme carbonic anhydrase. The Sanford Underground Research Facility (SURF) provides a unique environment to investigate and isolate extremophilic microorganisms that could be used in this biomineralization process. DNA and RNA isolation were performed on core samples taken from for SURF genomic and transcriptomic analysis to determine the native flora on this environment as well as metabolic activity. Samples were also placed in enrichment media to select and isolate any microorganisms capable of carbonic anhydrase production. In addition, a thermophilic bacterium, *Geobacillus* sp. WSUCF1, was investigated for its biomineralization capabilities.

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