

Carbon Recycling: Gas Fermentation Turning Sustainable Carbon into Fuels and Chemicals

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Abstract

Atmospheric CO₂ has accumulated to levels unprecedented since the Pliocene Epoch (> 2.6 million years ago). Although the effect of elevated atmospheric CO₂ on the climate has been predicted for 60 years, it wasn't until the 2016 Paris Agreement that nations agreed plans to abate atmospheric CO₂ release. These plans necessitate that sustainable carbon resources increasingly displace fossil resources as feedstocks for fuel and chemical production. The economic crisis triggered by the COVID-19 Pandemic has now added urgency to the demands for a move away from traditional polluting production systems. The opportunity being highlighted is that the public finance used to stimulate economic recovery be targeted at a technology that enable a circular, sustainable economic model. Numerous technology solutions have been proposed to enable this transition. Gas fermentation is the most recent of these. This technology uniquely offers a path to produce impactful volumes of sustainable fuels, chemicals and food from abundant, low value above ground carbon feedstocks.

LanzaTech is pioneering the commercialization of a gas fermentation process that allows the continuous production of fuels chemicals from gases at scale. Our first commercial plant is commissioned in China. Further commercial plants are in design or under construction with the process having been demonstrated with live feeds of waste gas from numerous industries and synthesis gas produced from agricultural wastes and municipal waste.

The potential role that gas fermentation could play in enabling a circular economic model has been enhanced through the development of a complete suite of synthetic biology techniques in gas fermenting organisms. This has led to an array of new chemical products being produced from gaseous feedstocks. In this way gas fermentation is a vital bridge in the effort to create value from waste streams as part of an increasingly circular economic model.