# Biomass Program

## Bioproducts R&D

## Separative Bioreactor

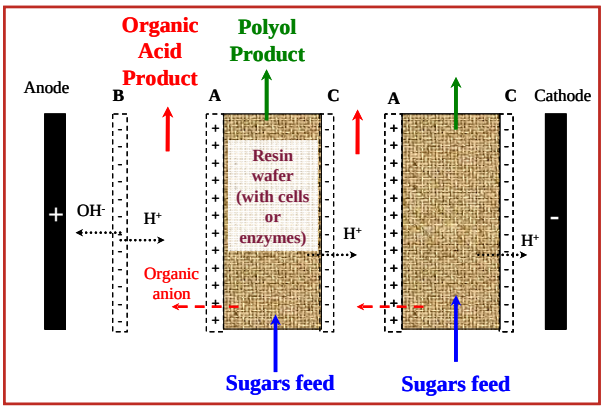
Separations are fundamental to the production and recovery of chemicals, materials, and fuels from biomass. It is estimated that separations should account for no more than 10-20% of the final product value in organic acid production. Current separation technologies do not meet this metric and Argonne National Laboratory's separative bioreactor (SB) offers a potential solution.

The SB is an electrically-driven, membrane-based process that integrates fermentation and product separations. As sugars are biocatalytically converted to organic acid (lactic, gluconic, etc.), the acid is transported through the membrane and into a concentrate channel. This enables a high rate of acid production while eliminating the need for neutralization or buffering of the acid and the need for downstream product separation. Other products such as polyols could be recovered from the sugar stream further downstream.

## R&D Pathway

The goal of this project is to demonstrate the economical production of organic acids using the separative bioreactor. Economic analyses of initial bench-scale experiments showed that the SB could significantly reduce production costs of organic acids.

Researchers are focusing on demonstrating sustained performance of the SB with: 1) long biocatalyst conversion and fermentation runs; 2) increased productivity and volumes; and 3) commercial-grade feedstocks. The project targets are a final acid concentration of approximately 150 grams per liter, commercial grade product purity, and sustained performance (approximately 1 year for membrane systems, approximately 1 month for biocatalysts)




The separative bioreactor stack shows two cell pairs (cell is composed of membrane-resin-membrane stack). A commercial system could include up to 100 cell pairs.

### Benefits

- **Significantly reduces separation and purification costs**
- **Enables production of organic acids and other chemical intermediates that are cost-competitive with fossil-based products**

### Applications

**This technology could revolutionize the production of organic acids and other chemical intermediates from biomass and accelerate the commercialization of integrated biorefineries.**

### Project Participants

**Archer Daniels Midland Company**
**Argonne National Laboratory**

### Project Period

**FY 2004 – FY 2008**

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