Biomanufacturing Systems for Chemical Upcycling

Tech ID: 34135 / UC Case 2025-761-0

BRIEF DESCRIPTION

Revolutionizing the upcycling of carboxylic acid-based chemical waste products to aldehyde derivatives using engineered biological systems.

FULL DESCRIPTION

This technology leverages engineered aldehyde dehydrogenases and nicotinamide-based coenzymes to reduce carboxylic acids to aldehydes without the need for ATP or CoA-based activation. Available in both cell-free or whole- cell systems, it offers the option to further reduce aldehydes to alcohols with the addition of alcohol dehydrogenases. The coenzymes are regenerated in situ by phosphite dehydrogenases, completing the catalytic cycle that enables robust conversion of renewable resources into valuable chemicals such as fuels, industrial commodities, and pharmaceutical compounds.

SUGGESTED USES

- Production of biofuels and renewable energy sources.
- Manufacturing of industrial commodities from bio-based feedstocks.
- Synthesis of pharmaceutical compounds through green chemistry.
- Chemical recycling and upgrading of biomanufacturing byproducts.
- Development of sustainable agricultural chemicals.

ADVANTAGES

- Direct reduction of carboxylic acids to aldehydes, reducing energy and raw material requirements.
- Capability to further process aldehydes into alcohols, broadening the range of producible chemicals.
- Utilizes renewable resources as feedstocks, aligning with sustainable manufacturing practices.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

CATEGORIZED AS

- **Biotechnology**
  - Industrial/ Energy
- **Energy**
  - Bioenergy
  - Hydrocarbon
- **Materials & Chemicals**
  - Biological
  - Chemicals
- **Research Tools**
  - Expression System
- **Agriculture & Animal Science**
  - Chemicals
- **Engineering**
  - Other

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