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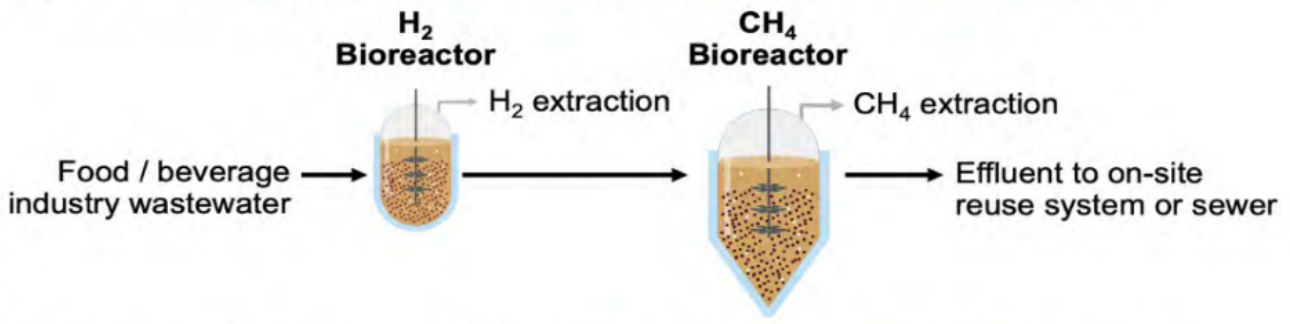
Encapsulated supported anaerobic biofilms for enhanced methane production

Encapsulated anaerobic biofilms for treating wastewater and generating desirable products such as methane or hydrogen gas.

Technology No. 2023-351



IP Status: Provisional Patent Application Filed

Applications

- Wastewater treatment

Key Benefits & Differentiators

- **Enhanced microbial activity (~27x more):** Increased retention from biofilm structure and the protective nature of the support
- **Energy efficient:** Does not require microbial separation/retention via a membrane to infinitely retain anaerobes within a bioreactor
- **Cost-effective:** Encapsulated biofilms can convert waste products to energy-rich gasses or useful precursors for commercial compounds of interest.

Technology Overview

Almost all industrial operations, whether they are food and beverage manufacturers, chemical industries, or refineries, generate wastewater that needs to be treated to remove contamination. Organic contaminants, such as those present in brewery wastewater at high concentrations, can become valuable resources with waste-to-energy systems. Anaerobic microorganisms can be utilized to convert complex biopolymers into methane which can be used to produce energy, but current approaches are energy-intensive due to the requirements of microbial separation or retention via membranes or specialized reactors. For these reasons, alternative approaches are required for bacterial retention in wastewater treatment applications.

Researchers at the University of Minnesota have developed an encapsulated supported anaerobic biofilm that can process wastewater with decreased energy requirements, and the method to make said encapsulated biofilms. By encapsulating the anaerobic bacteria, the bacteria are retained in the bioreactor without the need for membrane separation. The encapsulated biofilm produces on average 27 times more methane than encapsulated platonic bacteria. A two-stage reactor is utilized first to break down the organic compounds and then to generate the methane, resulting in a modular approach that can also be applied to the generation of other byproducts, including hydrogen gas. Pilot studies have been conducted with brewery and dairy wastewater demonstrating stable (>3 days) performance with >90% COD removal within <4 weeks of startup and stable performance of encapsulation chemistry (<15% 3-day moving average) over a > 30-day period.

Phase of Development

TRL: 5-6
Beta tested with real brewery and dairy wastewater

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

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