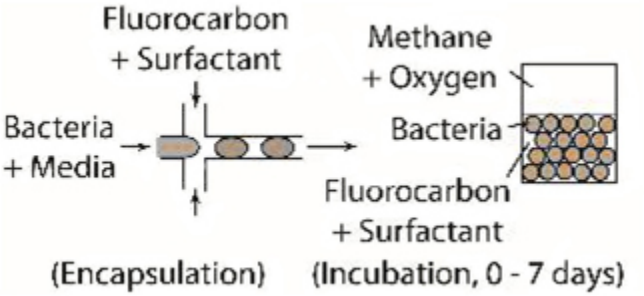
Docket #: S15-402

Accelerating Gas Transfer in Bioproduct Production

Stanford researchers developed a method to increase microbial fermentation gas transfer – a limiting factor in the production of bio products such as polyhydroxyalkanoates (PHAs). Researchers use a microfluidic device to create an oil/gas and aqueous/microorganism droplet emulsion. The emulsion increases the interfacial area of the aqueous phase and accelerates mass transfer of methane.



Microfluidic device and process flow

The method improves gas concentration, decreases production costs, and eliminates turbine mixing/agitation in high-density fermentation using methane, carbon monoxide or hydrogen gases.

Stage of Research
Researchers demonstrated that the (agitation free) emulsion-based fermentation method ensures cell growth rates comparable to agitation. The fermentation process became rate-limited by cell metabolism, not gas transfer.

Applications

- High-density fermentation production of bioproducts, such as PHAs
- Greenhouse gas mitigation
- Environmental remediation of pollutants

- Biodiesel generation

Advantages

- Lower operation cost and power demand

Publications

- Jaewook Myung, Minkyu Kim, Ming Pan, Craig S. Criddle, Sindy K.Y. Tang."Low energy emulsion-based fermentation enabling accelerated methane mass transfer and growth of poly(3-hydroxybutyrate)-accumulating methanotrophs." *Bioresource Technology*, Volume 207, May 2016, Pages 302-307. doi:10.1016/j.biortech.2016.02.029

Patents

- Issued: 10,273,510 (USA)

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