Docket #: S15-463

Method for enhanced microbial electrosynthesis by using defined co-cultures

Researchers in Dr. Alfred Spormann's lab have developed a method of using co-cultures to enhance microbial electrosynthesis to allow more efficient production of desired products such as biofuel. Microbial electrosynthesis is a process where microbial organisms convert electric current plus carbon dioxide into organic compounds, including chemicals and biofuels. This process has promising potential for the production of industrially relevant products from carbon dioxide, but increased efficiency would be beneficial for large-scale use. To help improve the efficiency the inventors took advantage of their finding that the electrosynthesis process could be separated into two coupled steps that use different microbes: microbes that are capable of fast electron uptake from cathodic surfaces and microbes that are effective production platforms for compounds of interest. Use of the microbial co-culture allows for a highly effective surface-bound electron uptake coupled with efficient surface-independent biosynthesis. This method enhances the overall electrosynthesis rate and may aide in the development of commercial scale biochemical reactors.

Stage of research
Validation studies have been completed and show promise.

Related technology
The Spormann lab has also developed additional microbial electrosynthesis technologies (see Stanford Docket S14-200).

Applications

- Microbial electrosynthesis

    - Biofuel production
    - Production of carbon dioxide-neutral chemicals

Advantages

- Increases efficiency of microbial electrosynthesis
- Spatial and organism decoupled process- allows for independent engineering and operating two fundamentally different metabolic processes
- Strains can be optimized independently to ensure maximum output
- Avoids build-up of intermediates
- Provides means to produce biofuel without involving biomass or photosynthetic microorganisms

Publications

- U.S. Patent Application Serial No. 15/374,949.

Patents

- Published Application: 20170166883
- Issued: 10,494,596 (USA)

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