



Methods to Improve Power Density of Micro-Sized Microbial Fuel Cell (MFC)

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Background

Microbial Fuel Cells can be considered as one of the most efficient biofuels for energy production and waste disposal. A microbial fuel cell (MFC) or biological fuel cell is a bio-electrochemical system that derives a current by imitating bacterial interactions found in nature. MFCs can be considered as miniaturized power sources (using MEMS technology) as well as used to study the behaviors of individual microorganisms. Micro-sized MFCs have the potential of an alternate portable power source but, the power density of the micro-sized MFCs is significantly lower than that of its macro-sized counterparts. The existing MEMS MFCs also have shorter lifetime and a long start-up time making it unacceptable for a practical portable power source.

Invention Description

Researchers at Arizona State University have developed a method of fabricating MFCs that can produce high power density. The existing manufacturing processes use bacteria that are not efficient in generating high power density. Also, the existing MEMS MFC design causes high internal resistance resulting in slow start-up and loss of power generation. The method developed by researchers at ASU uses Geobacteraceae enriched bacterial cultures that generate high current and have been shown to increase power densities by as much as 100 times. The MEMS MFCs have been designed such that it decreases the internal resistance which in turn increases the power density and accelerates the start-up time. This also ensures long term sustainability of power generation.

Potential Applications

- Electric vehicles
- Consumer electronics
- Wastewater treatment plants (the bacteria could consume the waste material or the organic material and produce supplementary power for the plant)
- Medical applications (Eg. Pacemakers)

Benefits and Advantages

- Portable
- Lightweight
- Environment friendly as they use renewable form of energy
- High power density (improved by ~100x)
- Low start-up time