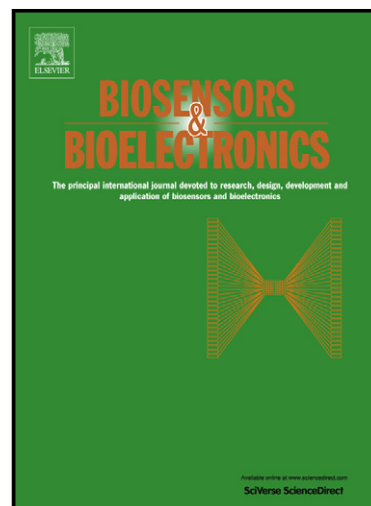


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www.elsevier.com/locate/bios

PII: S0956-5663(14)00370-4
DOI: <http://dx.doi.org/10.1016/j.bios.2014.05.037>
Reference: BIOS6799

To appear in: *Biosensors and Bioelectronics*

Received date: 15 March 2014
Revised date: 8 May 2014
Accepted date: 15 May 2014

Cite this article as: Hao Ren, César I. Torres, Prathap Parameswaran, Bruce E. Rittmann, Junseok Chae, Improved Current and Power Density with a Micro-scale Microbial Fuel Cell Due to a Small Characteristic Length, *Biosensors and Bioelectronics*, <http://dx.doi.org/10.1016/j.bios.2014.05.037>

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Improved Current and Power Density with a Micro-scale Microbial Fuel Cell

Due to a Small Characteristic Length

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Abstract:

A microbial fuel cell (MFC) is a bio-electrochemical converter that can extract electricity from biomass by the catabolic reaction of microorganisms. This work demonstrates the impact of a small characteristic length in a *Geobacteraceae*-enriched, micro-scale microbial fuel cell (MFC) that achieved a high power density. The small characteristic length increased the surface-area-to-volume ratio (SAV) and the mass transfer coefficient. Together, these factors made it possible for the 100- μ L MFC to achieve among the highest areal and volumetric power densities -- 83 μ W/cm² and 3,300 μ W/cm³, respectively -- among all micro-scale MFCs to date. Furthermore, the measured Coulombic efficiency (CE) was at least 79%, which is 2.5-fold greater than the previously reported maximum CE in micro-scale MFCs. The ability to improve these performance metrics may make micro-scale MFCs attractive for supplying power in sub-100 μ W applications, especially in remote or hazardous conditions, where conventional powering units are hard to establish.

Keywords: Micro-scale microbial fuel cell; mass transfer; scaling effect; power density.

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