

# Accepted Manuscript

Design of explicit models for estimating efficiency characteristics of microbial fuel cells

A. Garg, Jasmine Siu Lee Lam

PII: S0360-5442(17)30877-0

DOI: [10.1016/j.energy.2017.05.180](https://doi.org/10.1016/j.energy.2017.05.180)

Reference: EGY 10988

To appear in: *Energy*

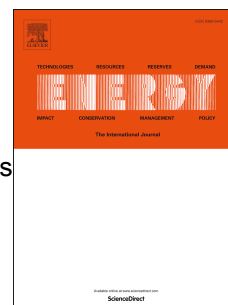
Received Date: 21 September 2015

Revised Date: 30 April 2017

Accepted Date: 18 May 2017

Please cite this article as: Garg A, Lee Lam JS, Design of explicit models for estimating efficiency characteristics of microbial fuel cells, *Energy* (2017), doi: 10.1016/j.energy.2017.05.180.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# Design of Explicit Models for Estimating Efficiency Characteristics of

## Microbial Fuel Cells

A. Garg<sup>1,2</sup>, Jasmine Siu Lee Lam<sup>1</sup>

<sup>1</sup>School of Civil and Environmental Engineering, Nanyang Technological University,  
50 Nanyang Avenue, Singapore 639798

<sup>2</sup>Department of Mechatronics Engineering, Shantou University, Shantou 515063, China

### Abstract

Recent years have seen the use of microbial fuel cells for the generation of electricity from wastewater and renewable biomass. The efficiency characteristics (power density and voltage output) of fuel cells depend highly on their operating conditions such as current density, chemical oxygen demand concentration and anolyte concentration. Computational intelligence methods based on genetic programming and multi-adaptive regression splines are proposed in design of explicit models for estimating efficiency characteristics of microfluidic microbial fuel cells based on the operating conditions. Performance of the models evaluated against the actual data reveals that the models formulated from genetic programming outperform the multi-adaptive regression splines models. The robustness in the best models is validated by performing simulation of the models over 8000 runs based on the normal distribution of the operating conditions. 2-D and 3-D surface analysis conducted on the models reveals that the power density of the fuel cell increases with an increase in values of chemical oxygen demand concentration and current density till a certain value and then decreases. The voltage output decreases with an increase in values of current density while increases with an increase in values of chemical oxygen demand concentration to a certain limit.

**Keywords:** Microbial fuel cell; MFC features modelling; MFC features prediction; fuel cell modelling; microbial microfluidic cell; computational intelligence

Download English Version:

<https://daneshyari.com/en/article/5475819>

Download Persian Version:

<https://daneshyari.com/article/5475819>

[Daneshyari.com](https://daneshyari.com)