

## Bioelectricity Generation of Coconut Waste -based Double Chamber Microbial Fuel Cell with Various Substrate Compositions

Siti Kudnie Sahari<sup>1,2</sup>, Nasley Ursula Mundi Anak Ujai<sup>1</sup>, Sabbah Mohd Rafe<sup>1</sup>, Martin Anyi<sup>1,2</sup>, Kuryati Kipli<sup>1</sup>, Zainab Ngaini<sup>3</sup>, Yanuar Zulardiansyah Arief<sup>1,2</sup>, Muhammad Rusop Mahmood<sup>4</sup>, Abdul Rahman Kram<sup>1</sup>, Marini Sawawi<sup>1</sup>, Asmahani Awang<sup>5</sup>, Kasumawati Lias<sup>1</sup>, Hazrul Mohamed Basri<sup>1,2</sup>, Hafsa Nahrawi<sup>3</sup>, Lilik Hasanah<sup>6</sup>, and Zaidi Embong<sup>7</sup>

<sup>1</sup>Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), 94300 Kota Samarahan, Sarawak

<sup>2</sup>Institute of Sustainable & Renewable Energy, Universiti Malaysia Sarawak 94300 Kota Samarahan, Sarawak, Malaysia

<sup>3</sup>Faculty of Resources Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

<sup>4</sup>NANO-SciTech (NST), Institute of Science, Universiti Teknologi MARA (UiTM), 40450 Shah Alam, Selangor

<sup>5</sup>Faculty of Science and Natural Resources, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia

<sup>6</sup>Faculty of Mathematics and Sciences Education, Indonesia University of Education

<sup>7</sup>Faculty of Applied Science and Technology, Universiti Tun Hussein Onn Malaysia, Muar, Johor, Malaysia

### ABSTRACT

*The aim of this study was to investigate the generation of electricity in a microbial fuel cell (MFC) using coconut waste as substrate with various compositions. Different types of substrate with different pH values were tested in dual-chamber MFC. The maximum voltage level reached 699mV under alkaline condition after day 7th, which was considerably higher than those previously reported in literature using solid waste substrates. The series connection of the coconut waste MFC with boost converter module showed the ability to light up the bulb. Our results showed that implementation of local organic waste was promising in fabricating MFC for home appliances.*

**Keywords:** Microbial Fuel Cell, Coconut waste, nutrient, pH, grahite, copper, zinc

## 1. INTRODUCTION

Renewable energy production has resumed in an effort to lessen the negative effects of fossil fuel consumption on the environment. One of the potential renewable energies is microbial fuel cell (MFC). MFCs utilize the bio catalytic capabilities of viable microorganism and are capable of using a range of organic fuel source by converting the energy stored in the chemical bonds, to generate an electrical current instead of relying for example, on the use of metal catalysts [1]. Microorganism such as bacteria, can generate electricity by utilizing organic matter and biodegradable substrates such as wastewater, whilst also accomplishing biodegradation product such as municipal wastewater [2]. Significant attention has been given to substrate of MFCs due to its biological factors that can affect the overall performance of MFCs, including its bioelectricity generation and operational cost [3]. The development of a bio-potential, due to the bacterial metabolic activity in the anodic compartment, an electron acceptor conditions in the cathode, leads to generation of bioelectricity in MFCs. In anodic compartment, the electrochemically active microorganism can donate electrons to an anode, which are liberated by oxidizing organic or inorganic waste, thus producing a source of energy. In review, there are few sources of organic waste that have been studied for the generation of bioelectricity, including potato waste [4], wheat straw [5], rice waste [6] and sago waste [7]. It was reported that the maximum current