CHAPTER

Energy generation from fish-processing waste using microbial fuel cells

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5.1 Introduction

The use of fossil fuels in recent years has accelerated, especially the use of oil and gas, and this has triggered a global energy crisis. Concerns about climate change and increasing global demand for the finite oil and natural gas reserves are intensifying the search for alternatives to fossil fuels. Renewable bioenergy is viewed as one of the alternative ways to overcome those problems (Wang et al., 2020). A technology using microbial fuel cells (MFCs) that convert the energy stored in chemical bonds in organic compounds to electrical energy achieved through the catalytic reactions by microorganisms has generated considerable interests among academic researchers to find the alternative way for electricity generation. According to Singh et al. (2020a,b), MFC is a device that directly converts chemical energy to electricity through catalytic activities of microorganism. Electricity has been generated in MFCs from various organic compounds including carbohydrates, proteins, and fatty acids. It is made up of two compartments, anode and cathode, separated with proton/cation exchange membrane such as Nafions or salt bridge. The membrane or salt bridge allows hydrogen ion generated in the anode compartment to be transferred into the cathode compartment (Miller et al., 2019).

Microorganisms oxidize the substrate and produce electrons and protons in the anode chamber of MFC. Electrons collected on the anode are transported to the cathode by an external circuit (Kakarla and Min, 2019; Lee et al., 2019). Meanwhile, protons are transferred through the membrane internally. Electrons and protons are consumed in the cathode compartment by utilizing oxygen from water (Bond, 2003). Besides its potential to generate electricity, MFC also can be used to measure the strength of wastewater. Application of MFC for wastewater treatment could be an alternative to reduce the cost of treatment. These MFCs was performed well for chemical oxygen demand (COD) and biochemical oxygen demand (BOD) removal that demonstrated the effectiveness of this device for

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