Technology Overview

Osmotic Microbial Fuel Cell for Wastewater Power Generation and Purification

OTT ID# 1266

TECHNOLOGY

The technology uses forward osmosis integrated into a microbial fuel cell to improve the efficiency of the fuel cell and the quality of the treated wastewater to meet water reuse requirements. Wastewater flows through the anode chamber where water is drawn across a membrane into the cathode chamber resulting in the generation of electricity, an effluent prepared for aerobic digestion, and saline water. The saline water can be further processed using desalination methods like reverse osmosis to yield potable water (Figure 1). Current development of this technology is at the benchtop stage with results published in a recent issue of Environmental Science and Technology.

Microbial fuel cells (MFCs) are an attractive technology with great potential for simultaneous wastewater treatment and bioenergy production. The main application of MFCs is secondary biological treatment. There is increasing attention to sustainable wastewater treatment, especially producing effluent for water reuse. The effluent from current MFCs cannot meet the reuse requirement. Conventional microbial fuel cells are limited in the extraction of purified water from wastewater and lack the driving force provided by forward osmosis in the the osmotic microbial fuel cell that may promote energy generation.

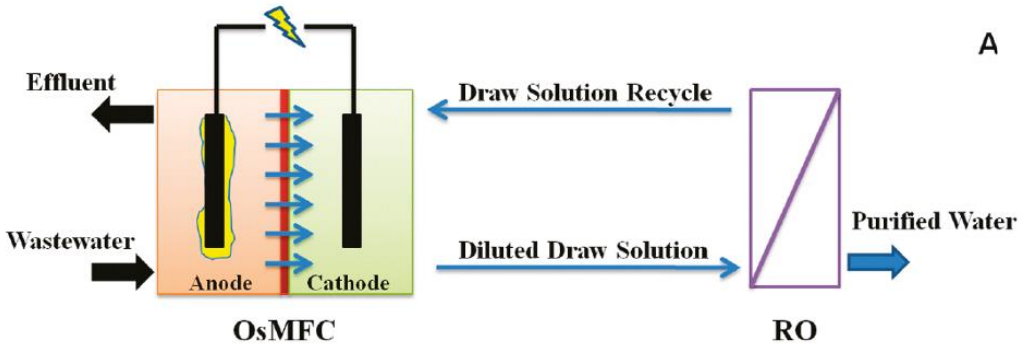
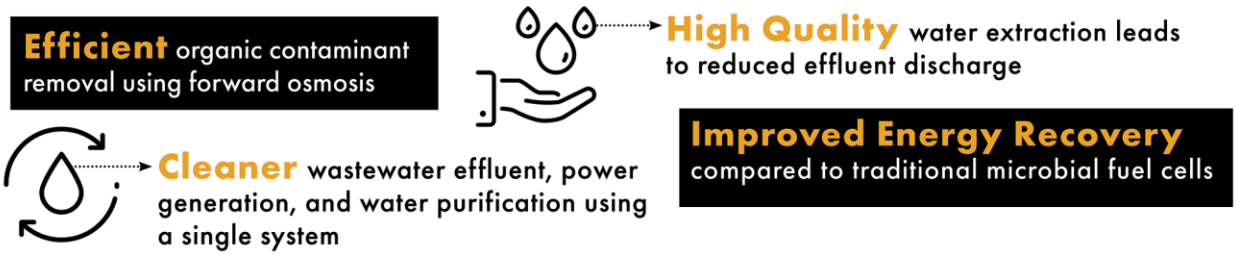


Figure 1. Osmotic Microbial Fuel Cell coupled with a Reverse Osmosis System

FEATURES/BENEFITS



UWM RESEARCH FOUNDATION

Technology Overview

INTELLECTUAL PROPERTY

A provisional patent application has been filed with the U.S. Patent and Trademark Office. This technology is part of an active and ongoing research program and is seeking partners for development of the final product. It is available for developmental research support/licensing under either exclusive or non-exclusive terms. UWMRF is currently working with the international engineering consulting firm Gannett Fleming, Inc. (http://www.gannettfleming.com/) to further develop a prototype for this technology. We are looking for a partner company with the capabilities to scale up, test, and utilize the osmotic microbial fuel cell for wastewater treatment.

MARKETS

The water and wastewater treatment the market was valued at $478 billion in 2016 and is estimated at nearly and is projected to reach $674 billion by 2025 (HexaResearch) with $90 billion in processing equipment by 2022 according to Research and Markets. The osmotic microbial fuel cell is a new way to process wastewater that provides a market advantage beyond wastewater treatment but also is capable of generating electricity from untapped wastewater energy sources. This technology can be installed in treatment facilities along the coast using seawater as the draw solution or in an inland facility using a saline solution.

RELATED PUBLICATIONS

F Zhang, KS Brastad, Z He; *Integrating Forward Osmosis into Microbial Fuel Cells for Wastewater Treatment, Water Extraction and Bioelectricity Generation*; Environmental Science and Technology, 2011

INVENTOR

Dr. Zhen (Jason) He

Dr. Zhen (Jason) He is currently an Associate Professor in the Department of Civil and Environmental Engineering at Virginia Polytechnic Institute and State University. He was previously the Assistant Professor in the Department of Civil Engineering & Mechanics at the University of Wisconsin-Milwaukee. Dr. He's research focuses on bioenergy production from wastes/wastewater, biological wastewater treatment, environmental biotechnology and microbiology, and environmental electrochemistry.

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