UWM RESEARCH FOUNDATION

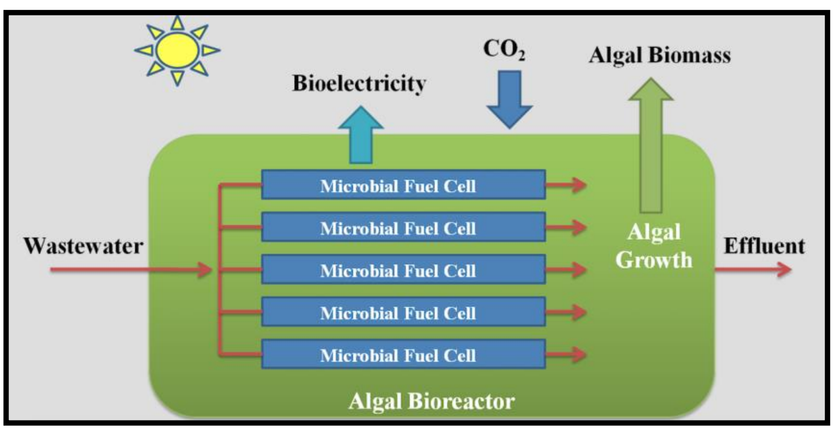
Technology Overview

Integration of Microbial Fuel Cell Within Algal Bioreactor OTT#1265

TECHNOLOGY

Municipal wastewater treatment plants play a critical role in environmental protection, but the operations of such plants consume an extensive amount of energy. An ongoing challenge to sustainability is developing improved wastewater management with reduced energy demands and increased energy recovery from waste. To solve this issue, the inventor has developed a novel energy-efficient treatment system that removes both organic wastes and nutrients within wastewater while producing bio-electricity and biomass (algae) through integrated bio electrochemical and microbiological processes.

In this system, wastewater is fed into the microbial fuel cells (MFCs) where organic contaminants are converted into bio-electricity; the remaining nutrients are then discharged into an algal bioreactor for algal growth, which strips nutrients out of the water before the treated effluent is released for final treatment (e.g., disinfection). Installing MFCs inside an algal bioreactor yields algae producing oxygen via photosynthesis; the MFCs use this oxygen for their cathode reactions, thereby reducing the need for aeration. Meanwhile, MFC cathodic reactions can maintain pH if CO_2 is added into the bioreactor. Through such a combination, the two treatment processes are cooperatively linked for the same purpose of treating wastewater, with two different bioenergy products: bioelectricity from the MFCs, and algal biomass for biofuels production. Overall, the system hopes to combine previous methods of wastewater removal processes in order to achieve the most energy efficient method possible.



FEATURES/BENEFITS

Dual Use allows for the production of bioelectricity and biomass simultaneously

MFcs and algal bioreactors rely on **lower energy consumption** to process and treat wastewater

The use of algae for bioenergy produces **higher yields** than other power alternatives

Efficient Waste Removal of both organic wastes and nutrients from wastewater treatment facilities using only one method

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INTELLECTUAL PROPERTY

US 9130216 – Integrated photo-bioelectrochemical systems

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.

MARKETS

The global market for algae biofuels is expected to have enormous growth and expansion within the next decade. Recently, petroleum, aviation and biofuel companies have been largely increasing their investments in the algae biofuel market due to a number of reasons, the largest reason due to the United States and Europe being unable to produce corn, soy or rapeseed fast enough in order to meet their biofuel targets.

There are several applications for algae to biofuels including: Biodiesel, Biobutanol, Bio gasoline, methane, ethanol, hydrogen derived renewable fuel and jet fuel. Although algae costs more per unit than other biofuels, algae is the fastest growing plant in the world and will yield 10 to 100 times more fuel per unit area than the biofuels currently on the market. With these newfound investments and acknowledged benefits, the algae biofuels market will continue to rapidly grow in the coming years and is anticipated to become the main commodity for fuels by 2020.

Source: Emerging Markets, Whatech/Market Research

INVENTOR

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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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