

Microbial Fuel Cells

Reactor Types

Batch Fed: Each cell's media is periodically replaced, generally when the cell shows signs of decline.

Constant Flow: The media is constantly moving through the cell, often at a very slow rate to avoid damage to the biofilm.

(1) Organic wastes are oxidized (electrons are taken) by the microbial biofilm present on the anode, creating carbon dioxide, protons, and electrons as products.

Reactor Media

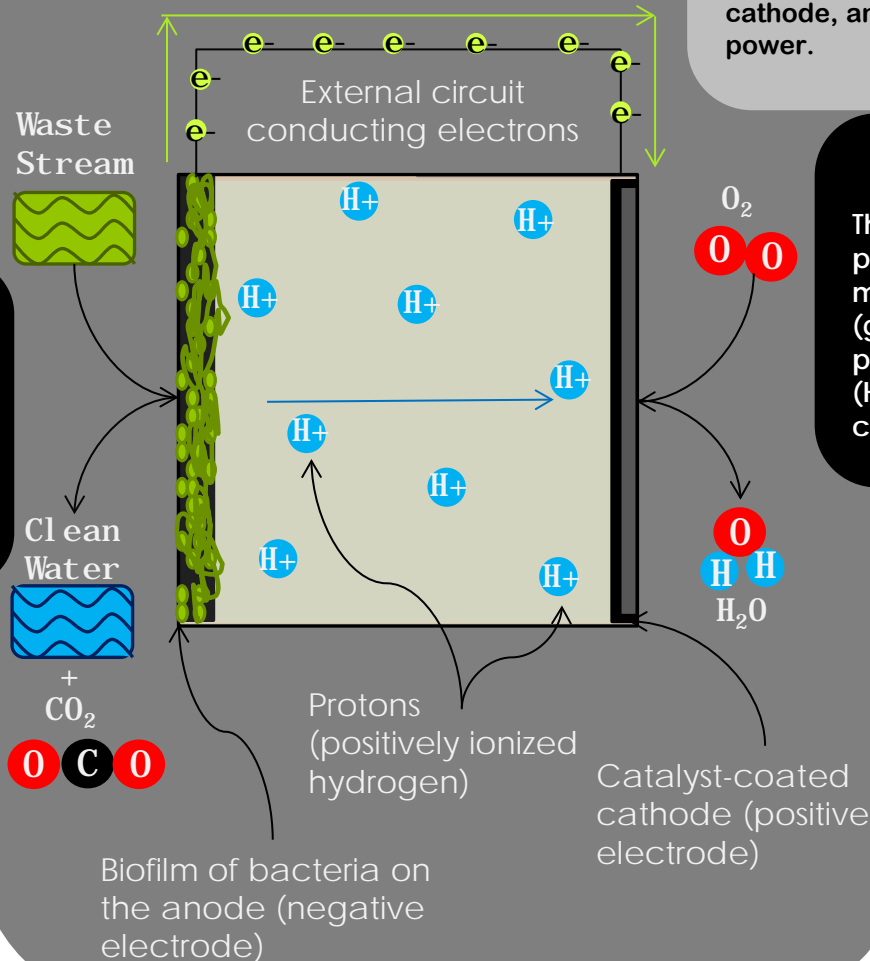
While in an experimental setting a growth media is commonly used, the versatility of the bacterial biofilm could allow power to be produced from just about any organic matter in the solution.

(2) The electrons are transferred to the anode and sent through an external circuit to the cathode, while the protons diffuse to the cathode through the solution. The external circuit powers whatever device the fuel cell is connected to.

Background

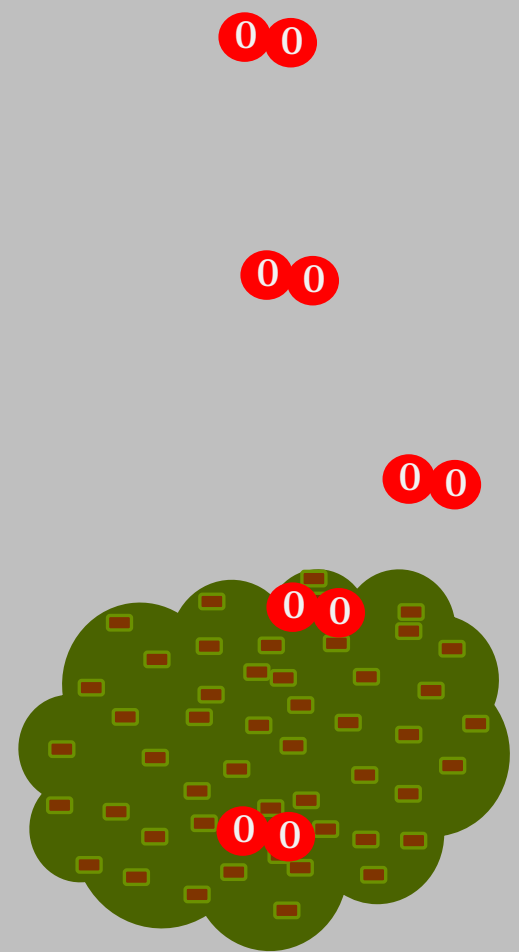
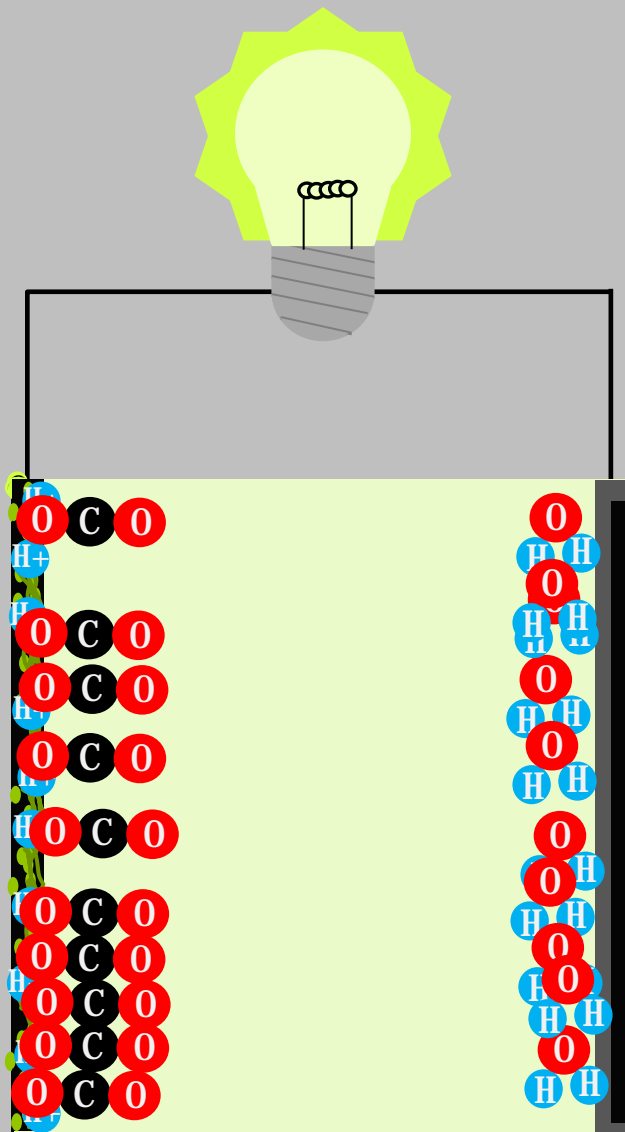
In a normal environment, microbes break down organic solids through aerobic respiration to extract energy. In an MFC, part of the process is rerouted through an external system that is used to generate electrical power. The microbial products are carbon dioxide, protons, and electrons. The protons and electrons combine with oxygen at the cathode, and the electron flow is what is used for power.

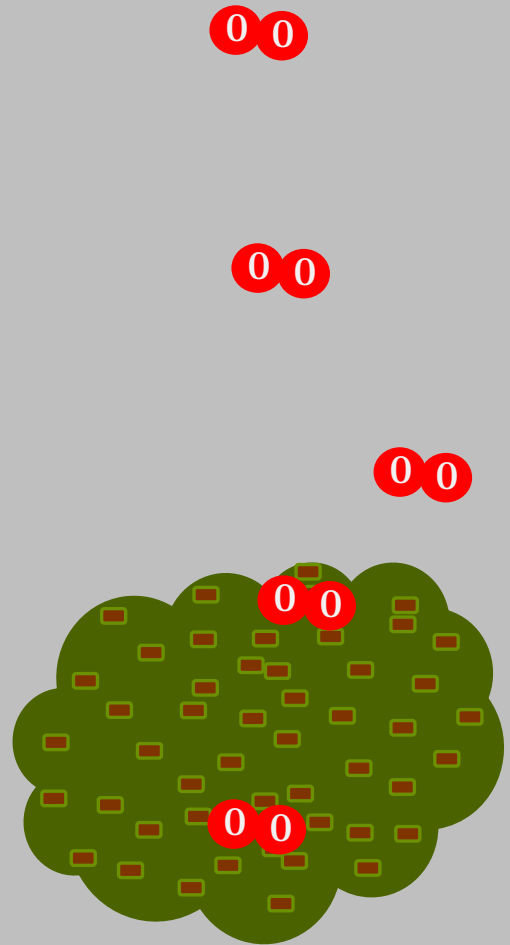
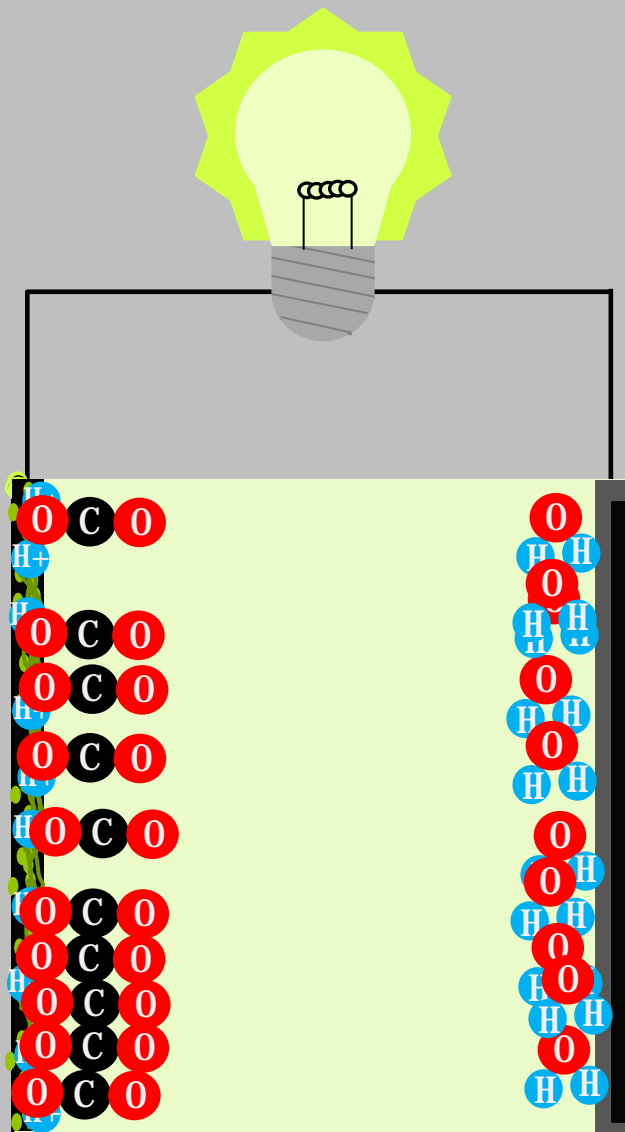
(3) The cathode, where the protons and electrons meet, oxygen reduces (gives electrons to) the protons to form water (H₂O), catalyzed by the coating on the cathode.



Components-

- Casing: Plastic
- Anode: Carbon cloth
- Cathode: Carbon cloth treated with PTFE, activated carbon, and carbon powder.
- External Circuit: Wire with resistor (either ceramic or adjustable)
- Reactor Media (growth solution): Sodium acetate, buffers, vitamins, minerals, and potassium and ammonium chloride.





Fluid Waste