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Applications of microbial fuel cells

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Microbial fuel cells are one of the most promising clean energy and waste treatment options with a potential of commercialization today. They use electrogenic bacteria as the workers of the reactor to extract electrons from various carbon sources and deposit part of these electrons onto the anode in the fuel cell structure. While the electrons are transferred to cathode, they pass over an electric load and do work. While electricity production using microbial fuel cells still faces significant challenges such as low currency and power generation as well as scale-up issues, the broadness of the substrate use possibilities makes microbial fuel cells very attractive for biotechnological applications. Among some of the most common ways of utilizing microbial fuel cells is wastewater treatment, biosensor applications and novel designs. Our research focuses on all these aspects of microbial fuel cells use. In our laboratories, fuel cells were used for breakdown of actual or model lignocellulosic waste materials to show that these substrates could be excellent options. Recalcitrant wastewaters such as toxic textile dye wastewaters proved to be possible candidates for treatment using microbial fuel cells. Another problematic waste is the black water from olive-mill treatment released into nature without proper and effective waste treatment. Recently we also showed a good example of biosensor application in microbial fuel cells by detecting and quantifying neomycin antibiotic in the wastewaters. Finally our current aim is to develop easily printable Polydimethylsiloxane (PDMS) micro cells with the inside-printed electrodes. All these examples prove that microbial fuel cells present excellent potential for a wide range of biotechnological applications.

Biography

Hakan Bermek has focused mainly on microbial fuel cells in the past 10 years. His expertise also covers specific topics of the fields of molecular biotechnology, biomaterials, novel designs and microbial enzymes.

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