# Efficient Energy Harvesting Using Bio-Nanowires

Park, Edward

Rapid industrialization and urbanization worldwide have resulted in global water pollution problems. Traditional wastewater treatment plants generate a tremendous quantity of sludge. Approximately 16,500 Wastewater Treatment Plant facilities in the United States disposed of estimated 8+ million tons of municipal sludge in 2010. Microbial fuel cell (MFC) represents a new approach to wastewater treatment with production of clean electricity energy using microorganisms. Most microbes are electrochemically inactive, and thus MFC often uses mediators which are expensive and toxic to microorganisms in the high concentration required for good current generation. The purpose of this project is to investigate efficient energy harvesting of a mediator-less MFC by using bio-nanowires produced from Shewanella Oneidensis bacteria. In this project, an imitation of wastewater is used to generate electricity. Synthetic wastewater was made from M9 minimal growth medium and carbon food sources such as glucose and acetate. This experiment exhibits how concentration of bacteria in the anode chamber, different types of carbon sources and the substance concentration affect electricity generation. Voltages from the MFC system and pH values of the solution in the cathode chamber are measured and recorded using the Arduino board data acquisition system. The results showed that the mediator-less MFC using bio-nanowires can produce voltage which is close to the maximum attainable MFC voltage. The efficient MFC can be used to treat wastewater while reducing energy needs and producing an alternative form of energy.

**Awards Won:**