Magnetotactic Bacteria with a Faraday Application

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The purpose of this research was to determine whether magnetised Magnetotactic Bacteria can be used to generate electricity. Magnetotactic bacteria (MTB) biomineralize intracellular nanoparticles of magnetite (magnetosomes). However, these bacteria swim towards oxic-anoxic transition zones or according to geomagnetic fields in order to maintain optimal growth conditions. These two characteristics of MTB (magnetisable magnetosomes and movement) were used to generate electricity by means of Faraday`s law of electromagnetic induction. MTB were isolated from fresh water with a magnet. The MTB isolate were cultivated in homemade and laboratory prepared growth mediums. Light, transmission electron (TEM) and scanning electron (SEM) microscopy as well as electron diffraction spectroscopy (EDS) were performed. A magnetising tube (responsible for magnetised magnetosomes) was built. The MTB`s natural movement were simulated and kept constant with a peristaltic pump. An induction tube with copper windings was built. The magnetised MTB moved through the induction tube and electricity was generated with Faraday`s law of electromagnetic induction. Compared to published work the micrographs indicated unique characteristics of MTB. The scanning electron microscopy indicated magnetosomes and the electron diffraction spectroscopy indicated iron inclusions. At first a current of 0.05mA was generated, but as the MTB multiplied over three days a current of 0.31mA was generated. The hypothesis: “It is possible to generate electricity by using magnetised Magnetotactic Bacteria (MTB) in a Faraday application”, proved to be correct.

Awards Won:

Second Award of $2,000