CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J1126

Project Title
Alternative Water Disinfection Methods: Diamond Electrodes in Water Electrolysis

Abstract

Objectives/Goals
Using chlorine to disinfect water can contribute to health hazards. I read an article this summer about a new method of water treatment through water electrolysis. The objective of this project was to determine if electrolysis was a safe and effective disinfection method, and if so, which electrode combination used in an electrolytic cell would provide optimum disinfection properties. My hypotheses stated that electrolysis would be an effective method of water treatment and that a diamond and diamond electrode combination used in the electrolytic cell would exhibit the most desirable water treatment properties.

Methods/Materials
I performed a total of 210 tests with twelve different experimental electrode combinations consisting of diamond, silver, copper, steel, aluminum, zinc, and iron which were tested on untreated creek water. I plated the water samples using Coliscan Easygel. I incubated the plates, then counted the number of bacterial colonies. Each treated sample was also tested for pH, total dissolved solids, and copper levels or iron levels as appropriate.

Results
My findings showed that electrolysis was an effective method of water disinfection although some of the metal electrode combinations leached metal contaminants into the treated water. The electrode combinations that used diamond electrodes eliminated 100% of the bacteria. My experiments indicated that all the diamond electrode combinations (except the diamond and copper combination) leached no metal into the water. The diamond and diamond electrode combination appeared best suited for electrolysis since it eliminated the microbes and did not contribute any metal contaminants.

Conclusions/Discussion
The diamond and diamond electrode combination completely disinfected the water each time and leached no metals into the water. Electrolysis using diamond electrode technology appears to be a safe and effective method of water treatment for human consumption.

Summary Statement
The goal of this project was to explore electrolysis, including diamond electrode technology, as a safe and effective alternative method of water disinfection.

Help Received
Thanks to my parents for their time, supervision and support. Thanks to John Stewart and Michael Becker for their donations of electrodes. Thanks to my science teacher for her guidance.