CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
J1101

Project Title
Photocatalytic Water Purification

Abstract

Objectives/Goals
My objective is to find the best substance to be used as a catalyst in the photocatalytic water purification.

Methods/Materials
I tested Titanium Dioxide, Zinc Oxide, Iron Sulfate, Sodium Fluoride, and Magnesium Malate, because they are good semiconductors, and they absorb light easily, which are the two main characteristics of photocatalysts. I added the different substances to 16OZ water bottles filled with river water, then I used agar petri dishes to grow bacteria from the original collected river water as well as the water treated by the 5 different catalysts after 3 different time lapses (10, 15, and 20 hours). I checked the bacteria growth of the original water and the water treated by the photocatalysts after each sun exposure period applying the Petroff-Hausser cell counter method, using a grid and a microscope to count the number of bacteria on each agar petri dish, and I compared the results.

Results
The data showed that Magnesium Malate, unlike the other photocatalysts, was able to eliminate all traces of bacteria in water within 20 hours. Magnesium Malate gave the best results for photocatalytic water purification. Magnesium has a vital role in plants' photosynthesis, it can absorb large amounts of light at a time, so it is a powerful photocatalyst to start the oxidation process of the microorganisms for photocatalysis.

Conclusions/Discussion
The performance of Magnesium Malate as a catalyst that harnesses the UV radiation from sunlight and uses the energy to break down a wide variety of organic materials, organic acids, pesticides, and microbes, was proven to be superior then other catalysts. Using Magnesium Malate as a photocatalyst and the sun UV light for water purification is an environmentally friendly, sustainable and inexpensive solution, especially for addressing drinking water quality issues in the developing countries, as well as disinfecting water after natural disasters.

Summary Statement
I found that Magnesium Malate is the best catalyst to be used in photocatalytic water purification

Help Received
None. I performed the experiment myself