CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
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Project Number
34036

Project Title
Purifying Water Using the Thermoelectric Effect

Abstract

Objectives/Goals
My objective was to see if the Peltier cell could be used in an apparatus to effectively purify water using the electrical energy equivalent of a small to medium-sized solar panel.

Methods/Materials
Materials used in the testing of apparatus: Peltier cell, 6V and 12V batteries, battery charger, measuring cup, funnel, water, infrared thermometer, styrofoam insulation, thermal grease.

I designed and created an apparatus that could efficiently heat and evaporate water then transfer the vapor to the other side of the cell to condense into purified liquid water. I first measured how the amount of water in contact with the hot side of the cell affected the temperature difference between the hot and cold sides of the cell at various power levels and the equilibrium temperatures.

Testing methods:
- 80-minute trials
- Poured designated volume of water into apparatus
- Attached cell to battery
- Checked surface temperatures on cold side (1 area) and hot side (3 areas) to measure temperature difference between cold and hot sides
- Measure volume of purified water collected
-calculated total energy input and energy output

Results
After 30 minutes of running the apparatus, the water on the hot side of the cell began to boil, at which point the water vapor rose, and a steady flow of water droplets began condensing into the cold side of the cell. The cool, condensed water helped to maintain the temperature gradient between the hot and cold sides of the cell, perpetuating the process. Since the Peltier cell has both a hot and cold side, my apparatus used the cold side as the condenser and the hot side as the evaporator, serving as a near perfect energy recycler.

Conclusions/Discussion
The Peltier water purification apparatus effectively purifies water at a relatively high efficiency. Better insulation and solar thermal preheating of the water could improve the efficacy of the device. Ideally the battery would be replaced by a solar panel, so the electricity input would come solely from the sun.

Summary Statement
I created an apparatus incorporating a Peltier cell to purify water via evaporation and condensation.

Help Received
Dad helped saw aluminum cooling fins, cut glass, and answered questions about design/experimental flaws.