CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Ryan Mei

Project Number
S1116

Project Title
Atmospheric Water Generation Using Hygroscopic Substances

Abstract

Objectives/Goals
The objective of this project is to create a device that uses cheap and readily available materials to extract moisture from the atmosphere and produce clean water without fuel or electricity. Current methods either require exotic materials, humid air that is near dew-point, or large amounts of external energy input.

Methods/Materials
Three substances (calcium chloride, silica gel, and montrimorinlite clay) were tested for their for their ability to absorb and release moisture. The weight of a glass dish of each substance was measured on a scale before and after 48 hours in the atmosphere, and after being heated on a hot plate.
Based on the results, a solar atmospheric water generator was then constructed using the silica gel. Materials and tools used included a plastic tub, PET plastic sheets, aluminum foil, mylar, hot glue, a hand saw, and power drill. The mass of water collected each day was measured with a scale.
Subsequent versions experimented with fans and thermoelectric elements.

Results
Though calcium chloride absorbed the most water, it released the least water. Silica gel proved to be the material most effective at absorbing and releasing moisture.
Using silica gel, the device was able to generate 8 grams of water per 100 grams silica every 24 hours, on average.

Conclusions/Discussion
Based on test results, silica gel shows great promise as a material for water generation. The device would need 25 kg of silica gel in order to generate the 2L/day of water needed to survive, which would cost significantly less than conventional methods of atmospheric water generation (silica gel costs about $0.55/kg) and require no electricity or fuel. A full-scale device to provide to provide enough drinking water for one person every day would cost around $45.

Summary Statement
I created a low cost device to produce drinking water from atmospheric moisture.

Help Received
Ms. Angela Merchant of Henry M. Gunn High School allowed me to use the scales and hot plates in her classroom. My father helped me use the power tools to build this project.