CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
Caitlin E. Thompson

Project Number
S1817

Project Title
Bio-Inspired Design of a Dew Catcher Based on Nanotechnology

Abstract

Objectives/Goals
Inspired by the fog catching beetle of the Namib Desert, I am testing prototype designs for a dew capturing surface, using nanotechnology and recycled materials, that is capable of collecting drinkable water for humid air.

Methods/Materials
MATERIALS
Hydrophobic nanoparticle spray, Hydrophilic spray, Rainex spray, CDs , Metal disks, Pipettes, Tissues, Scale, Instrument to measure dew point.

METHODS
CDs or metal disks were coated with either hydrophobic, hydrophilic or Rainex sprays or half coated in hydrophobic and half in hydrophilic. The CDs and disks were placed out at night and the dew point was measured. In the morning, water collected on the CDs or disks was removed with a tissue and the tissue was weighed to see how much water collected. Pictures were also taken of water drops on all substances.

Results
The contact angle on hydrophile was 9 degrees, while on glass it was 11 degrees. Water did not form drops or roll off either the hydrophilic surface or plain glass.
The hydrophobic spray from Nanobead did result in a superhydrophobic surface with a contact angle of > 150 degrees. Microscopic examination of that surface showed that it consists of particles ranging from <100 nm to microns in diameter. Rainex did not reach the status of a hydrophobe.
For the metal disc, half of which coated with superhydrophobe and other half with hydrophil, we were able to collect 0,3 grams of water overnight. This is equal to 143 mL/m2.

Conclusions/Discussion
In my experiment, I found that hydrophilic coating enhance attraction while hydrophobic coatings decrease attraction. The variety of hydrophobic substances that was used lead to several new findings. Both Rainex and Teflon were surprisingly effective hydrophobes, although neither reached the level of a superhydrophobe. The hydrophobic spray from Nanobead did result in a superhydrophobic surface. The hydrophilic coating was only slightly more effective than uncoated glass. In testing prototypic fog catchers outdoors, I found that surface coatings increased the ability to capture water from air, relative to uncoated control surfaces. The most effective method for collecting water was a metal disk coated half with hydrophobic, half hydrophilic.

Summary Statement
Inspired by the fog catching beetle of the Namib Desert, I am testing prototype designs for a dew capturing surface, using nanotechnology and recycled materials, that is capable of collecting drinkable water for humid air.

Help Received
Used lab equipment of Hopkins Marine Station