CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
Sahil D. Patel

Project Number
J0214

Project Title
Developing a Piezoelectric Roof

Abstract

Objectives/Goals
This project investigated a renewable source of energy that could be used on a roof to make homes more energy efficient and sustainable. The goal for the piezoelectric model is to successfully generate any amount of electricity from the impact of rain and wind.

Methods/Materials
I built a model with piezoelectric sensors to generate electricity from the impact of rain and wind on the roof. The building of the model consists of two main parts: the roof structure to mimic a house and the testing surface, made to create electricity from applied force. To make the testing surface, I used two piezoelectric sensors made of Polyvinylidene fluoride and imbedded them within a sheet of vinyl. Next, I made the roof structure using polycarbonate sheets. I then attached the two, using spacers and foam, creating my piezoelectric roof. I used a multimeter to record the highest volts, amps, and watts produced within a minute when force was applied. I tested the piezoelectric model against three different strengths of rain, using a hose nozzle and wind, using a fan and a hair dryer, five times each.

Results
The wind tests averaged 0.0124 microwatts on the low setting. The medium setting measured 0.0599 microwatts, and the high setting yielded 0.1686 microwatts. The rain tests averaged 0.0682 microwatts on the low setting. The medium setting created 11.6397 microwatts, and the high setting obtained 87.9923 microwatts. Throughout the tests, the piezoelectric model successfully created electricity from the impact of rain and wind, which met the original requirements for the model. This shows that the technology is possible to use for a roof application.

Conclusions/Discussion
Throughout the tests, the data showed that the impact of rain generated more electricity than the impact of wind. This was expected, because rain has a larger mass than wind. I found that the reason for the low amperage was because of an error I made in the circuitry design, by not adding a resistor. With more time, I could create a new iteration in which I add a resistor to the circuit to correct the issue of extremely low amperage. The piezoelectric model demonstrates it is possible to make energy from the simplest, most common resources, like rain and wind. In the future, we could incorporate this technology into solar panels, floors, roads, and buildings. Energy, in the form of kinetic waves, could be converted into harvestable electricity.

Summary Statement
This project developed a piezoelectric roof that generated electricity from the impact of rain and wind.

Help Received
My father cut the polycarbonate sheets and helped test the piezoelectric model. My mother also helped test, and bought the materials for my model. Mrs. Work provided general oversight and helped me fill out this application.