CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
S1511

Project Title
Cooler Roofing

Abstract

Objectives/Goals
I set out to answer the following question: Which new roofing material, proposed to meet the requirements of recent California legislation, reflects the most light and reaches the lowest maximum temperature? I predicted that a white roofing material would reflect the most light and reach the lowest maximum temperature.

Methods/Materials
My materials included: a light meter, a heat lamp with 2 bulbs, 2 thermometers, 2 plastic storage boxes, 6 roofing samples including: white bitumen, black bitumen, granule bitumen, white plastic, black plastic, and tan plastic. To carry out my experiment I built and wired a heat lamp, placed one roofing sample beneath each bulb of the heat lamp, and recorded both sample's maximum temperature after 45 minutes using a standard barbecue thermometer. Each sample was tested beneath each side of the heat lamp for precision. I also visited a camera shop and used a light meter to measure the light reflected off of each material compared to a gray sample which had a reading of 7.0. To find which color of roofing material reflected the most light and reached the lowest maximum temperature, I tested different colors and two different types of materials.

Results
My experiments showed that white plastic roofing material changed least in temperature with a change of 28ºF, followed by tan plastic(37ºF) and white bitumen(38ºF). Of the two kinds of white material, the white plastic's maximum temperature was lower while the white bitumen reflected a little more light. The white bitumen reflected the most light in the light meter test with an average reading of 9.1.

Conclusions/Discussion
My experiments showed that overall, white plastic roofing reached the lowest maximum temperature while white bitumen reflected the most light. Although I predicted white to reach a lowest maximum temperature and to reflect the most light, this experiment allows me to see that an alternative colored roofing material can be used and have the same effects as a white material. This is shown in the tan plastic's temperature change of 37ºF compared to the white bitumen's temperature change of 38ºF. I find these measurements interesting, because they show an alternative, perhaps more aesthetically appealing and cleaner looking roofing choice for consumers that does not have the same negative environmental effects as a darker roofing material.

Summary Statement
My experiments tested the maximum temperature and light reflectance of roofing materials that have been proposed to meet the requirements of recent California legislation.

Help Received
My father helped me find a project idea, took pictures of me doing my project, and resized my pictures; Kanishka Reddy let me use his circular saw; Mike Hurley, Mike Melvin, and Sean Bammel pro0vided me with roofing samples; Roger N. from Samy's Camera helped me measure light reflectance.