CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
J1506

Project Title
What's on Your Roof? A Study of Roofing Material Emissivity and Albedo Properties

Abstract

Objectives/Goals
This experiment determined which type of roofing material had the highest emissivity and albedo properties. It was hypothesized that the lighter roof color will cause the temperature of a detector, receiving heat emitted from the test panel, to increase by 10ºC over a steady state temperature and have an albedo of at least 0.75. Scientists have suggested that global warming may be reduced by quickly returning heat and light from the sun back into space using roof surfaces.

Methods/Materials
Four roofing samples were tested: Standard Roof Shingles, Sheet Metal over Shingles, White Roofing Paint over Shingles, and Foil over Shingles. Two tests were conducted on each sample: (1) The temperature rise of the Black Body Reflectance Detector (BBRD) while exposed to the emissivity emitted from the test panel; (2) The amount of light reflected from the test panel, or albedo, was measured.

Results
Test 1 showed the Foil over Shingles emitted the most heat causing a dramatic rise in the BBRD temperature, followed by Sheet Metal over Shingles and the White Roofing Paint over Shingles which were comparable. The Standard Roofing Shingles did not emit much heat. Test 2 showed the White Roofing Paint over Shingles is efficient at reflecting light but it did not emit heat as well as the Foil over Shingles. Foil over Shingles and Standard Roof Shingles performed poorly during the albedo test.

Conclusions/Discussion
The hypothesis was incorrect; the materials in this study did not increase the temperature of the detector by 10ºC above steady state and the albedo did not reach 0.75. While the White Roofing Paint over Shingles and the Sheet Metal over Shingles performed similarly, the light colored Sheet Metal over Shingles may be the most practical choice in trying to improve the environment, since this material balanced emissivity and reflectance properties. This data supports that because a surface is bright, it does not necessarily mean it emits heat well.

Summary Statement
Four roofing materials were evaluated to determine which material had the highest emissivity and albedo properties.

Help Received
Mother helped type report, Father helped with construction of test panels and graphs.