CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

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Project Number

J1109

Project Title

A Burning Question: The Effects of Selected Materials in Protecting Against UV Radiation

Abstract

Objectives/Goals

Our objective was to find out what effects glass and other materials have in protecting against harmful ultraviolet (UV) rays, and the sunburns and health problems that UV causes.

Methods/Materials

We did research on UV radiation and purchased a SolarTech meter that primarily measures dangerous UV-B light in the 297-310 nanometer (nm) range, with some response to UV-A. Next, we collected materials from our families and nearby businesses. These included: automobile and home window glass, regular and UV-resistant films and plastics, shirts (several UV-resistant), a straw hat, and two kinds of sunglasses. We took readings in full sun with each material screening the light. We also took readings for reference on overcast days, in the shade, at high altitude, and at various times on a given day.

Results

We've taken two sets of readings (January and March), and will take one more set in May to track how UV increases--due to the angle of the light--as summer approaches. UV Index (UVI) numbers (based on a widely used 1-10+ scale) nearly doubled from January to March, and we expect a similar increase in May. In comparing materials, our data showed that auto glass lets in a lot less UV than plain house glass--4% of full sun compared to 25%. Our red polo shirt protected much better than a white polo or t-shirt, although the UVI was quite small. Not all fabrics promising UV resistance fully stopped UV. Our UV-protected dress shirt allowed about the same UV to pass as the red polo. "Body armor" for surfers did screen out almost all UV. UV-resistant plastic let 14% of full sun pass, a lot if the photo it's protecting is exposed to sun every day. We were very surprised by how much UV light penetrates the shade (39% of full sun) or the clouds (35%). We also found that UV is highest between 10 a.m. and 2 p.m.

Conclusions/Discussion

We started out wanting to know if we could get sunburned riding in a car. We learned that we're pretty safe there, compared to taking a nap in a sunroom. We discovered some materials and clothes protect considerably better than others, and that many UV-resistant materials don't provide as much protection as we would have expected. We also discovered that UV is everywhere, even in the shade or when the sun's behind the clouds. Finally, we learned what the most dangerous times are. Most of all, we now know not to argue when our parents tell us to put sunscreen on!

Summary Statement

Our project was explore how the intensity of UV light changes under various conditions, and learn how selected clothing, glass and plastic might help screen out some or all of these dangerous rays.

Help Received

Gary Apsit (grandpa); Faith Borden, National Weather Service; John Cofer, Independent Glass; Lynne and Francis Dickerson; Jill Fordyce; Carrie Kaufmann; Steve Mackin, SolarTech; Village Glass & Mirror; Tap Plastics.