CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
J1410

Project Title
Ultraviolet Ray Exposure vs. Surface and Time of Day

Abstract

Objectives/Goals
Many people get sunburned or tanned, which is a result of exposure to ultraviolet rays. The objective of this project is to determine whether certain surfaces should be avoided at certain times of day to minimize the exposure to UVA rays. I used UVA detecting, color changing beads and shirts (sensitive to approximately 365 nm wavelength) to assess UVA radiation over three different surfaces: concrete, asphalt, and grass. I tested under various conditions of time of day, weather, temperature, and humidity; in sun and in shade. Based upon my research regarding UVB radiation, I beleived UVA radiation would be highest over concrete and lowest over asphalt. I did not beleive that the temperature and humidity would affect the amount of UVA rays present, but I thought that cloud cover, sun and shade, would affect UVA ray intensity. I also believed the UVA rays would be strongest at 1:00 pm.

Methods/Materials
To carry out this experiment, I separated UVA sensitive beads by color and placed them in open, clear, plastic cases. I also exposed a UVA sensitive, color changing shirt at the same time as the beads over each of three surfaces: concrete, asphalt, and grass. I recorded the amount of time that it took the beads and shirts to change to their full color, or how much the color had changed after 15 minutes. I also recorded temperature, humidity, and weather conditions. These procedures were performed on multiple dates at 7:00 am, 1:00 pm, and 4:00 pm.

Results
My results showed that the beads changed color fastest over asphalt, which meant the beads received more UVA rays over this surface. Surprisingly, the beads changed color slowest over concrete. At 7:00 am and 4:00 pm, in many cases, the beads did not receive enough UVA rays to change to their full, bright colors. At 1:00 pm in the sun, the UVA sensitive beads were always exposed to enough UVA rays to change to their full colors.

Conclusions/Discussion
I had thought that UVA rays would be more concentrated over concrete than asphalt. Concrete is a reflective surface. According to my results, the UVA rays were in much greater concentration over the dark surface of the asphalt. This result was very consistent throughout the experiment. The UVA rays were also in far greater concentration at 1:00 pm than at 7:00 am or 4:00 pm.

Summary Statement
This project attempts to determine whether time of day (7:00 am, 1:00 pm, or 4:00 pm) or type of surface (concrete, asphalt, or grass) affect the degree of UVA ray exposure.

Help Received
I'd like to thank my science teacher for providing guidance, and Jeff Leichty and Brittany Cushing of Del Sol Company for their advice.