

## **Destruction of Natural Pigments by the Interaction of UV Light and Oxygen**

### **Abstract**

The Objective : This project's goal was to find out if laying fabric on grass increases fading of a stain by the sun. The idea came from my grandma who said this was a custom in her country. Because of the low UV index during the winter, I had to use artificial UV light in a lab.

I hypothesized that oxygen coming from the grass could interact with UV light from the sun and form ozone, a powerful oxidizing agent. Oxidation is an important process of fading, especially for plant pigments.

### **Methods/Materials**

- (1) Prepare fabric samples and dye white cloth with red wine
- (2) Make 4 trays, 2 with holes for gas inflow/outflow [trays A/B]
- (3) Mount 2 samples cards with one square of every fabric color and stained fabric] onto trays A/B and one onto trays C/D
- (4) Attach nitrogen tank to tray A and oxygen tank to tray B
- (5) Fill trays C/D with oxygen and seal with cellophane and rubber bands

- (6) 15 hours later take one sample out of trays A/B and remove sample from tray C
  - (7) After 24 hours remove remaining samples from tray A, B, and D
  - (8) Scan samples into computer using a color scanner
  - (9) Upload images into Adobe Photoshop and use histogram function to record average luminosity and plot the results
- Materials: UV light, plastic trays, green, blue, red, black, and white fabric (100% cotton), red wine, cellophane wrap, oxygen and nitrogen gas.

## Results

Fading was increased for the stained samples that were in the sealed oxygen trays compared to samples exposed to continuous oxygen or nitrogen flow. The differences were observed after 15 and 24 hours of UV light exposure. The black fabric showed a small amount of fading which did not seem to be affected by the conditions.

## Conclusions/Discussion

The stained fabric subjected to sealed oxygen and UV light showed the most fading. I had hypothesized that this is because ozone was able to build up in this tray and oxidize the wine stain along with the effects of the UV light.

Less fading was seen with the continuous flow of oxygen because ozone did not have a chance to build up. Nitrogen is inert so any fading was most likely due to the UV light itself. For the black fabric, the condition did not appear to matter suggesting that the fading was also due to the UV light. My grandma's stain trick on the grass may work because UV light from the sun causes the formation of ozone near the grass, which increases fading of the stain.

This project is about how pigments in a stain are removed through the interaction of ultraviolet light and oxygen.

### **Bibliography**

**www.thechemistryguru.com**