CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Nuha Iftekhar

Project Number

J1309

Project Title

The Effect of Different Light Sources on the Intensity of Phosphorescence

Abstract

Objectives

The purpose of this project is to observe the effect of different light sources on phosphorescence. The question asked is Do different types of light sources affect the excitation of phosphorescent materials? My hypothesis is that light types with shorter wavelengths will cause a higher state of excitation in phosphorescent materials. The procedure consisted of shining light from three different types of light sources over samples of phosphorescent powder and observing the brightness of the samples after absorbing a specific type of light. The results showed that the sample of phosphorescent powder emitted the brightest light when exposed to an ultraviolet light source. My hypothesis was supported, as the ultraviolet light source emitted light with a shorter wavelength as compared to the other light sources.

Methods

A light isolation chamber was created from cardboard and black paper. A commercially available phosphorescent powder was used to thinly coat one side of a circular adhesive sticker and laminated with tape to create identical samples. Three different light sources comprising UV, LED and Incandescent flashlights, were used to initiate the excitation of phosphorescence in the samples with a controlled duration of exposure. The light intensity from the samples was captured with a photo taken by a smartphone camera held at a fixed distance from the samples and holding camera settings constant for exposure. Readings were taken at equal intervals up to 5 minutes, starting from the same time after light exposure. A scientific image analysis software (ImageJ) was used to calculate average intensity in greyscale values across each sample and at each time point. The decay in light intensity for each light source over the period of observation as charted and compared.

Results

The experiment showed that the sample exposed to the ultraviolet light was the brightest and retained the most intensity by the end of the observed five minutes. After a ten-second period of UV exposure, the sample had a brightness of 195.2 grayscale value (255 is brightest). Using the initial UV brightness level as 100% and normalizing the other readings to this allowed for easier comparison. At the end of the five minutes, the UV sample had a brightness of 21% of the initial level. The LED sample showed an initial brightness of 66% of the initial UV level, decaying to 20% of this level. The incandescent sample had an initial brightness of 33% of the initial UV level, decaying to 11% of the initial UV level. This showed that the LED light produced 2/3rd the intensity of phosphorescence as the UV light, and the incandescent light produced only 1/3rd of this intensity, although all samples decayed to very similar levels at the end of 5

Summary Statement

My project establishes the superior effect of UV light to excite a phosphorescent material compared to LED and Incandescent light, using an inexpensive but reliable method to measure light intensity

Help Received

My science teacher, Mrs. Noor Zaweti, helped with the visual representation of my data. I developed the measurement method for light intensity alongside my father.