

Team 1st Report

Brian Gomez | Flow Visualization (MCEN 4151-001) | 10/14/2019

This image was created for our first team assignment for the Flow visualization class. My team had attempted to ignite various chemicals to produce different colors of flames, using a fume hood for safe ventilation. After several attempts, I was unhappy with the images I had taken and decided to use a different method with a campfire in my backyard. The goal of both setups was to capture the different element behaviors at high temperatures.

The basic physics of a flame is that a particle contains an excessive amount of energy which moves the electrons into a higher energy level and when they jump back down, from loss of heat energy in this case, they release a quantum of light also known as a photon (shown in **Figure 1.**) which is the visible part of a flame. The same physics applies to all elements and, when burned, also produce photons. The difference in color is due to the unique electron cloud structure of each element. The electrons have different levels to jump to when excited and, therefore, fall back down to a. Since the electrons fall to different energy levels, the photon will be a different color because each value of energy is associated with a respective wavelength of light. The color that is visible to the human eye is dependent upon this wavelength, with larger wavelengths appearing red and smaller values appearing violet as shown in **Figure 2.**

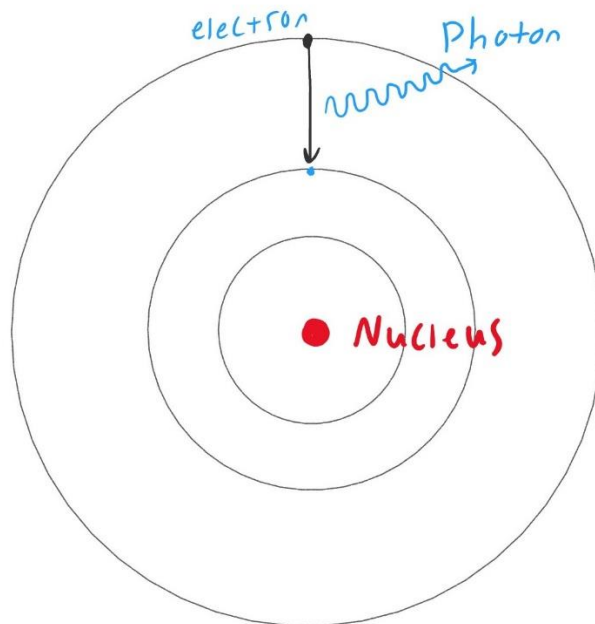


Figure 1.

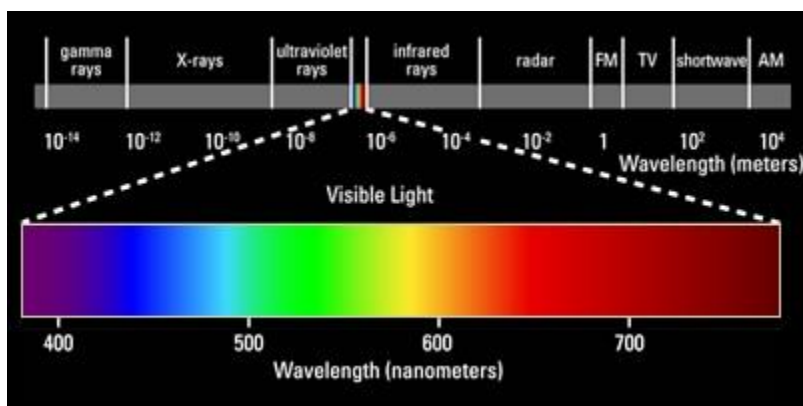


Figure 2.

The fire was constructed in my backyard in Boulder, CO using a 32" square metal pit. Once the flames were large and there was a decent base of coals in the bottom of the pit, the chemical packets were thrown into the base of the fire, so that the colors could propagate upwards through the entire fire. The chemicals used were copper sulfate pentahydrate, ammonium chloride, and calcium aluminate cement and the brand was called "Magical Flames" and I bought them in flammable packet form on Amazon.

The camera I used was a Nikon D3500. Because there was very little lighting, I used the maximum ISO of 25600, which is what contributes to the fuzziness of the image. The F-stop was f/5.6 and the shutter speed was 1/1600. I attempted to use Nikon's free editing software to make the image sharper or increase the colors, but everything I did distorted the image in ways I didn't like, so I submitted an unedited image.

This image does a great job at showing the colors of elements such as copper burning in comparison to a standard yellow flame of a campfire. My favorite part of the image is the blue flame ball disconnected at the top of the fire and the sparks coming from the base and off to the left because I think it captures the irregular nature of a campfire. I dislike the fuzziness on the image, and I would like to get sharper focus on the flames. In the future, I would like to try to mix and burn select chemicals again to make a rainbow flame, but with a better plan and execution this time.

References

“Illinois Coalition for Responsible Outdoor Lighting”

Accessed on 10/12/19

<http://www.illinoislighting.org/lightcolor.html>