

Fall 2018 Team First Fire on Concrete

MCEN: 4151

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## INTRODUCTION

Team first image, produced by Garrett Gerchar, Ivan Komodore, and Justin Truong, of flames from burning of isopropyl alcohol on a concrete floor. We wanted to visualize the flames produced by burning isopropyl alcohol on a concrete floor and how it released energy and the flows that can be seen in the flames. At first it was hard to accurately capture the flames but once we dialed in the ISO and other camera settings we were able to capture the flames in an accurate medium. Overall flames are a very interesting flow phenomenon to visualize.

## SETUP, PROCEDURE, AND FLOW

The setup for this image was a simple setup in open garage at night. Begin by having a partner pour about a 3 inch by 4 ft pool of isopropyl alcohol. Before ignition ensure garage-doors are open for ventilation, have sand and an ABC fire extinguisher on hand. Wearing fire retardant gloves ignite the accelerant, in this case isopropyl alcohol, using a long tip lighter. Once the flame has ignited setup camera on a tripod a safe distance away from the flame to protect both yourself and your camera equipment. Refer to Figure 1 for setup basics.

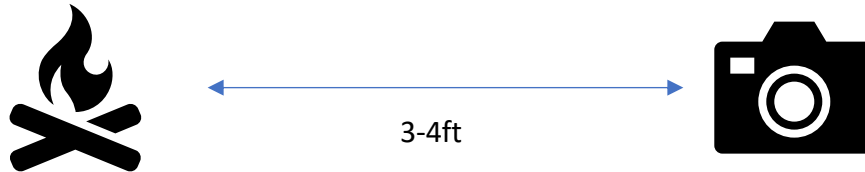


Figure 1: Basic photo setup

The flow in Figure 2 is that of isopropyl alcohol burning on a concrete floor. This is the release of the energy stored in the chemical bonds of the isopropyl alcohol to produce a flame. This produces a laminar flame similar to a candle flame with the blue underneath portion. Overall heat production of this flame is low but can be high in some points of the flame. This overall is a laminar flame caused from the burning of the isopropyl alcohol on a concrete surface.



Figure 2: Raw Image of Flame

## VISUALIZATION AND LIGHTING TECHNIQUE

This was a simple experiment using household isopropyl alcohol and ignition with a lighter. The room was an open concrete garage floor with the doors open for ventilation. It was night, so the lighting was perfect for capturing the flames accurately. Ensure that there is minimal external light besides that emitted by the flame.

## PHOTOGRAPHING TECHNIQUE

The setup of capturing this fluid flow is pretty simple with the right camera setup. The field of view of this image is 3 feet wide pool of burning isopropyl alcohol. The camera is about 3-4 ft from the flame for both safety and to capture the entire flow phenomenon. The focal length is 16. We used an exposure time of 1/1600 and an ISO of 6400. This Photo was taken on a SONY ILCE-6300. The photo went through post processing to produce Figure 3 was simply cropping it to center the jumping flame into the center of the image using the grid display in photoshop. As well as editing curves to bring out the three dimensionality of the photo.



Figure 3: Final Posted Photo

## IMAGE AND CONCLUSION

This image reveals how a flame is the release of energy and the randomized flow of the energy being released. I like how you can see distinct ridges in the photo and how it is composed of a perfectly black background. What causes fire to leap out of the main concentration of the flames? An improvement upon this could be burning on a perfectly clean floor to have less carbon burning for more orange color from a pure burning of alcohol. This photo really helps visualize how isopropyl alcohol burns.

## REFERENCES

“The chemistry and physics of flames.” Accessed 10/10/18.

[http://garfield.chem.elte.hu/Turanyi/oktatas/flames/Flames\\_1.pdf](http://garfield.chem.elte.hu/Turanyi/oktatas/flames/Flames_1.pdf)