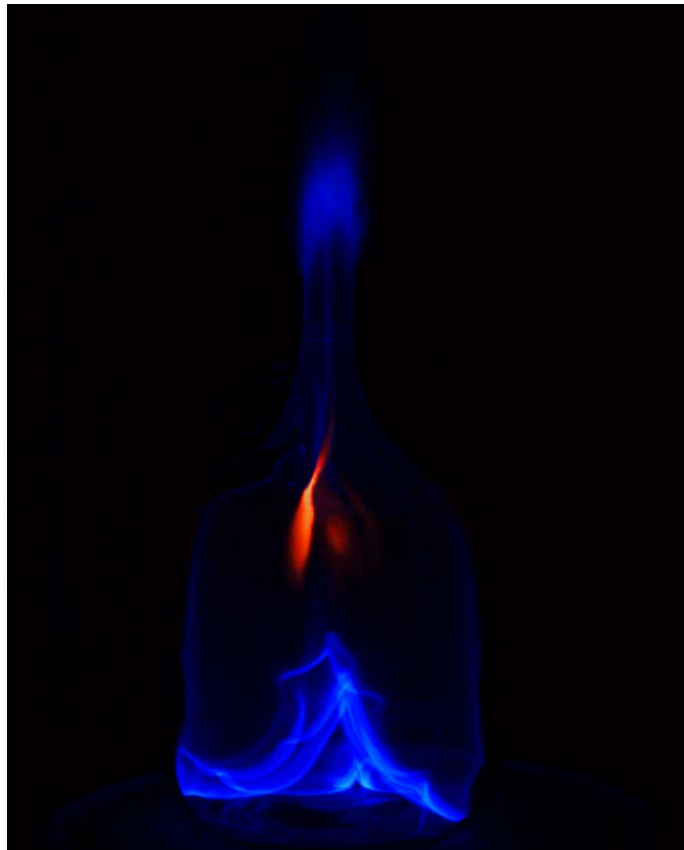


Flame Propagation Experiment

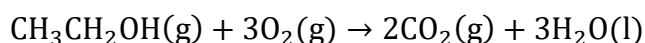


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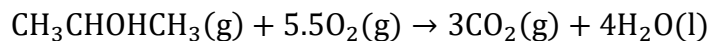
Team 2nd Image
MCEN 4151
Flow Visualization
Apr. 8, 2014

Background

The purpose of this assignment is to observe the effect of flame propagation experiments. Ethanol can be used as a fuel which is a renewable fuel. Ethanol, unlike petroleum, can be made by fermentation of grains or other sources of carbohydrate. Brazil uses almost exclusively ethanol to power their cars. In the U.S., ethanol is now used as an additive. A 10% ethanol 90% gasoline mixture is often called "gasohol"; it is also called an "oxygenated fuel" because an ethanol molecule contains an oxygen atom. Oxygenated fuel is used in many cities in the winter to reduce the emission of carbon monoxide from automobiles. Ethanol burns according to the following equation:



There is another fuel which is isopropanol (isopropyl alcohol), however, is a non-renewable fuel, because it is made from petroleum. We did not choose it with consideration of safety. Isopropanol burns according to the following equation:



Procedure

The experiment is conducted in a dark room which is located in Durning Lab. The process of the experiment according to the following steps:

1. Prepare an empty, clean jar and pour some alcohol into it.
2. Rotate the jar until the alcohol has wetted the whole jar.
3. Turn off the room light,
4. Put a flame gun over the mouth of the jar and fire until the alcohol fume catches fire. A blue flame can be seen dancing in the bottle. As gases expand, the flame shoots out the mouth of the jar.

A blue fire will be formed into the shape of the jar. A circle of red fire can be seen too because the roll of the fire in the jar.



Figure 1 Jar used for flame propagation experiment

To obtain the best picture, we need to make the room completely dark. We used a black paper to block the window on the door and use the black tape to block the holes on the paper.

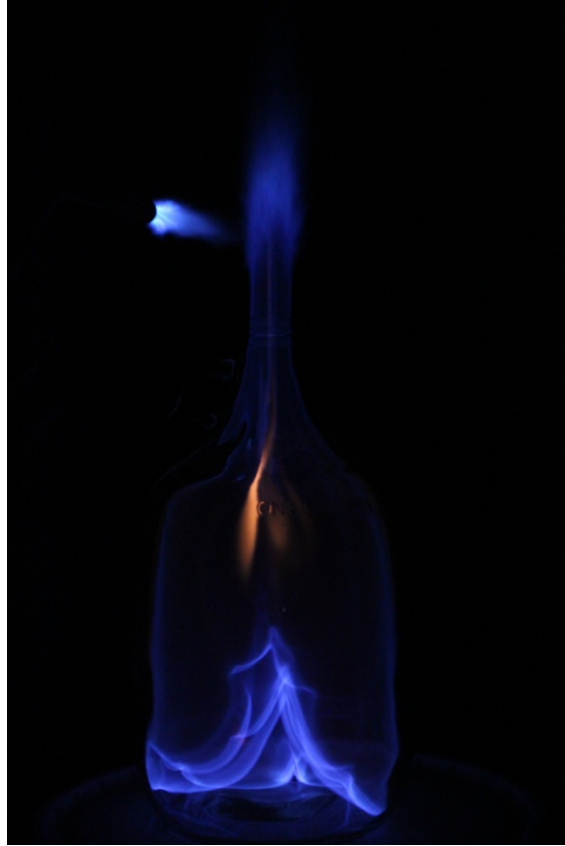


Figure 2 Team 2nd image (unedited)

Photographic Technique

The original picture was taken with exposure time of 1/125 seconds, ISO speed of 3200 and focal length of 40 mm. The ISO speed is high because the darkness. To make the shape of fire clear, I increase the contrast by using of Photoshop. From the original picture, there is the fire made by flame gun and it makes the whole image a little distracting. So I crop it off.

References

[1] Andy S. W. Sae, "Chemical Magic From Grocery Store" ISBN 0-7872-5586-6 (1996)