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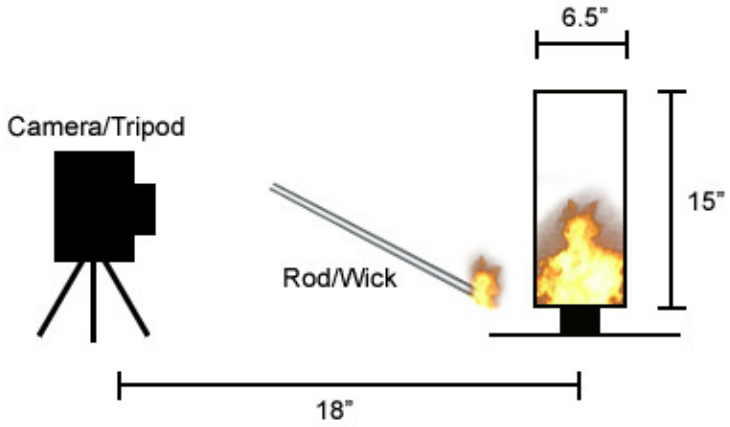
Team Project 2

This image depicts an experiment in combustion as well as the effect of a long exposure time on a dynamically lit scene. A methanol solution was scattered on a platform and covered with a plastic tube with an open top and bottom. The methanol was allowed to evaporate slightly and was then ignited from below. Several other chemicals were used while we were experimenting including brake cleaner, ethanol, and toluene. However, methanol provided the most aesthetically pleasing and interesting combustion. We attempted to create a trigger by running a high current through strands of steel wool to initiate the explosion, but were unsuccessful on the whole with achieving a consistent effect. Instead, we used a cloth wick wrapped around a steel pole, ignited by a lighter.

The image captures a 15 second time exposure of fire inside of a plastic tube. The tube is about 6.5 inches in diameter and about 15 inches tall. The plastic tube sits on a thin metal sheet. This sheet sits on top of two metal blocks that lift the apparatus up high enough off of the table to allow it to be lit from beneath. 100 ml of methanol were scattered on the metal sheet and allowed to evaporate slightly to saturate the environment with methanol. Air was fanned into the top of the tube to give the combustion process enough oxygen. A flame was then placed into the bottom of the tube using a steel rod with a cloth wick wrapped around it. This flame was placed through a small hole cut in the metal sheet.

The apparatus looked similar to this:



The result of placing a flame into an environment saturated with both methanol and oxygen is a small explosion. This explosion was photographed over a 15 second window, and the results were imaged. "Combustion or burning is a complex sequence of exothermic chemical reactions between a fuel and an oxidant accompanied by the production of heat or both heat and light in the form of either a glow or flames" (1). The combustion of methanol in our experiment produced an initial burst of energy followed by a period where flames were burning off the leftover methanol on the metal plate. "Combustion of a liquid fuel in an oxidizing atmosphere actually happens in the gas phase. It is the vapor that burns, not the liquid. Therefore, a liquid will normally catch fire only above a certain temperature, its flash point. The flash point of a liquid fuel is the lowest temperature at which it can form an ignitable mix with air. It is also the minimum temperature at which there is enough evaporated fuel in the air to start combustion" (1).

The “flow” in this image is not really a flow at all. It actually consists of glowing hot matter and the release of energy. The only light source in the image is the “flow” itself. The fire, produced by a rapid oxidation of the methanol, releases its energy in the form of heat and light. In this instance, the light is what shows up in the image. Because the exposure time is quite long, the image depicts every instance of light within the 15 second exposure window. All other lights in the room were turned off, and any light leaking into the scene would be negligible.

The field of view is fairly small, about 9 inches tall and 8 inches wide. The diameter of the tube itself was about 6.5 inches. The camera was placed on a tripod about 18 inches from the tube. The focal length of the lens was 24.0 mm. The camera used was a Kodak DX7630 Zoom, a digital camera. The original image width was 3456 pixels and the height was 2304 pixels. The ISO setting was 400, and the exposure time was 15 seconds. The instant of combustion was too difficult to isolate, so a long exposure time was chosen. This would allow all of the combustion and fire information within a 15 second window to be depicted on one image. The aperture was set to 4.5 to allow enough light in to view the fire and also to prevent too much light from getting through which would create too much contrast to view all the information in the image. Photoshop was used but not significantly. The image was cropped to remove some of the background that was illuminated by the fire. The tube itself also reflected some of the fire within it. This was airbrushed out because it was distracting and did not contribute to the image. The brightness, contrast, and colors were not changed.

The image reveals the combustion of methanol over a 15 second time period. Originally, I had wanted to capture an image at the very moment of combustion.

However, this was practically impossible with a push-button camera. We did experiment with a high-speed camera, taking video at 100 frames per second. As we went through the frames around the moment of the explosion, it became apparent that these images were not very interesting at all. In fact, we were not satisfied with any of the images within this video. The long exposure image was chosen because it produced an image with dynamic features that was aesthetically pleasing and provided a lot of information about the combustion. Blue flames dance around the sides and bottom while a red/orange flame emerges high in the center. I am very satisfied with this image. While specific details of the flame are not apparent because of the blur caused by the long exposure, the entire combustion is captured in one image. I would be interested in producing an image of the same nature on a larger scale to see what effect that would have. Also, even though we experimented with several other chemicals, it would also be interesting to see what other chemicals could produce, or perhaps a combination of several chemicals.

References:

1. Wikipedia. (2007, November 7). *Combustion*. Retrieved November 7, 2007 from http://en.wikipedia.org/wiki/Combustion