

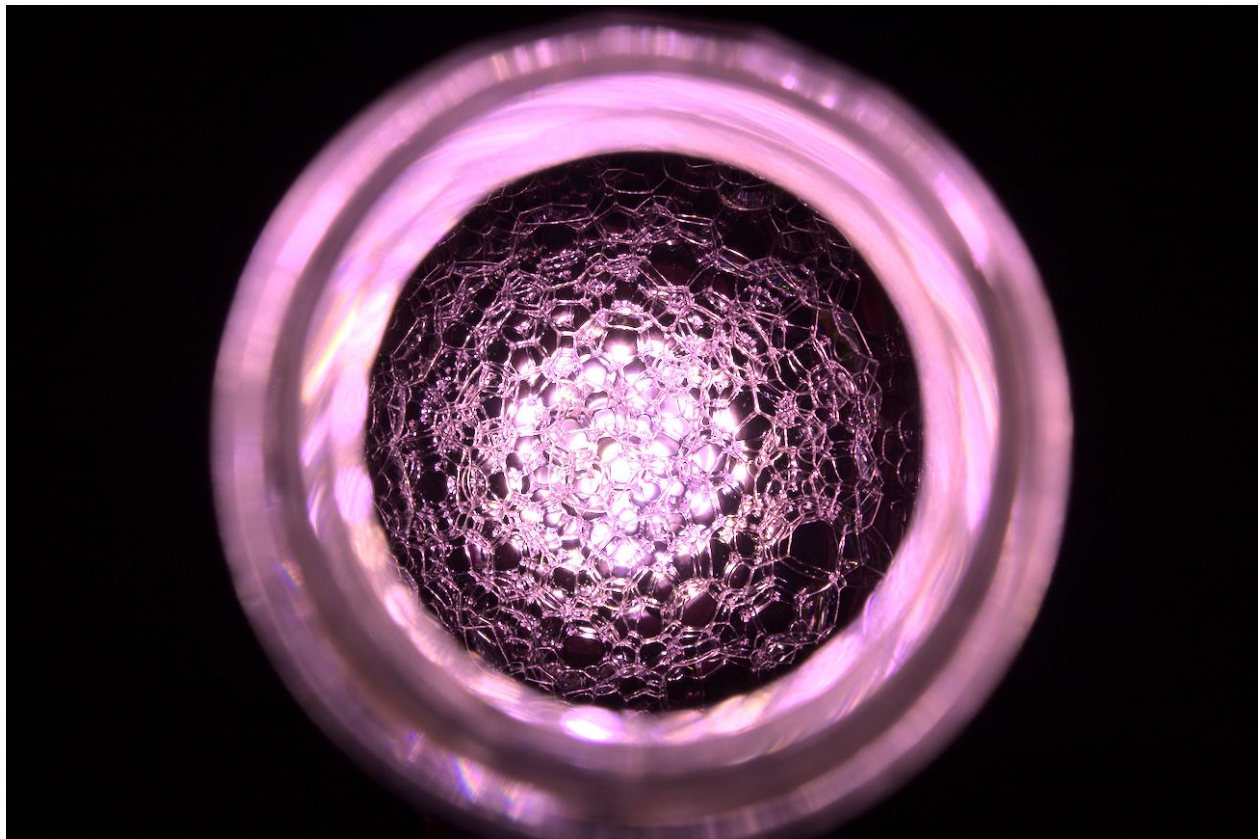
MCEN 4151: Flow Visualization

Section 001

Image-Video 02

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The Image-Video 02 assignment gave us an opportunity to create a better image after getting feedback and suggestions from our first Image-Video assignment. The intention behind the assignment was for us to create another fluids phenomenon and capture it using camera, adjusting any necessary setting in order to procure a high-quality image. From viewing and critiquing my classmate's images/videos during the first assignment, I was really interested in creating an image involving bubbles and the phenomenon behind them. Due to this, I decided to create bubbles by shaking hand soap and taking a top view picture. In order to add more depth and detail to the image, I decided to add a light illuminating the soap container from the bottom surface causing the bubbles and container to light up a pinkish color.

The basic fluid phenomenon that was captured in this picture was the creation of bubbles due to the internal circulation of gas within a liquid, in this case the hand soap. The amount of internal gas proportionally affects the diameter of the bubble, a greater diameter bubble is a result of more internal gas circulating within the liquid. The circulation of gas also affects the boundary conditions and the drag force of the bubbles. The drag force of the bubble is what determines the shape that the bubble takes on; a ridged sphere as the drag force decreases or a ridged spherical cap as the drag force increases. When looking at an individual bubble within the image produced, the bubble can be described as a ridged sphere. It can be implied that the drag force is decreasing which results in the creation of the bubbles shown in the image.

I initially created the bubbles by shaking a red Dial foam hand soap container, bought from Walmart. The initial result from shaking the container was a thick foam which was not what I wanted. I decided to let the container rest for about an hour so that foam became less thick which resulted in more distinct bubble formation. After getting the bubbles that I wanted, I decided to take the picture in a bathroom with the lights turned off to create the most natural blackest background that I could. I placed a flashlight, bought from Target, on the edge of the bathtub with the soap container balanced on top of it. I ended standing directly over the container, about 2 inches away, in order to take the image from the top opening of the container. The setup of the flashlight and container is shown below in *Figure 1*. *Figure 1* also shows how the camera was positioned in order to get the image that I got.

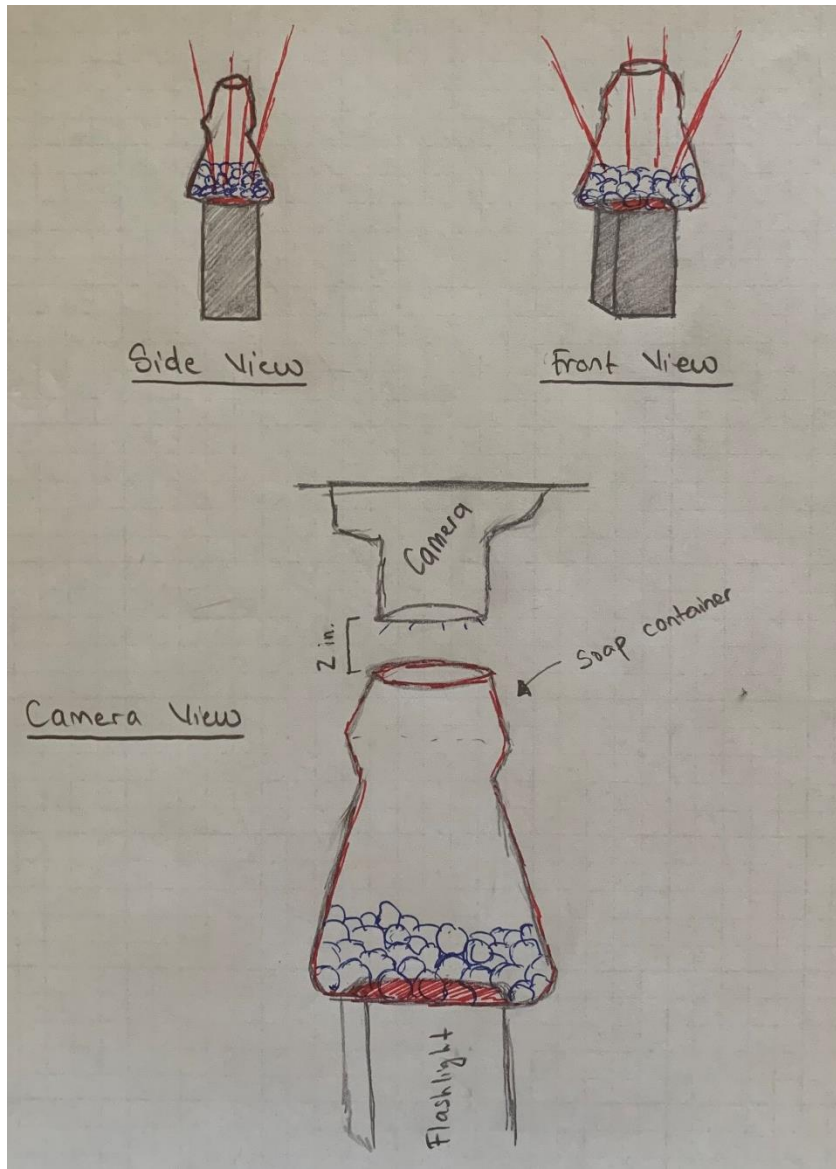


Figure. 1 Diagram showing the setup of the hand soap container & flashlight along with the camera view

The photograph was taken on a Canon EOS Rebel T6 camera. The camera lens was set up relatively close to the bowl aiming downwards to allow for greater magnification and detail in the swirls created by the food coloring. The settings were set as: focal length of 55mm, exposure time of 1/250sec, an ISO of 100, and f-stop of f/10. For the image processing, I ended up using Darktable to adjust my image very slightly. I did not really want to adjust my image too much since I really liked the original and thought the image did not need too much post processing adjustments. The only adjustment that I made was that I changed the base curve in order to make the pink color a little whiter. I felt that this was needed so that the black background contrasted more with the lighter pink color.

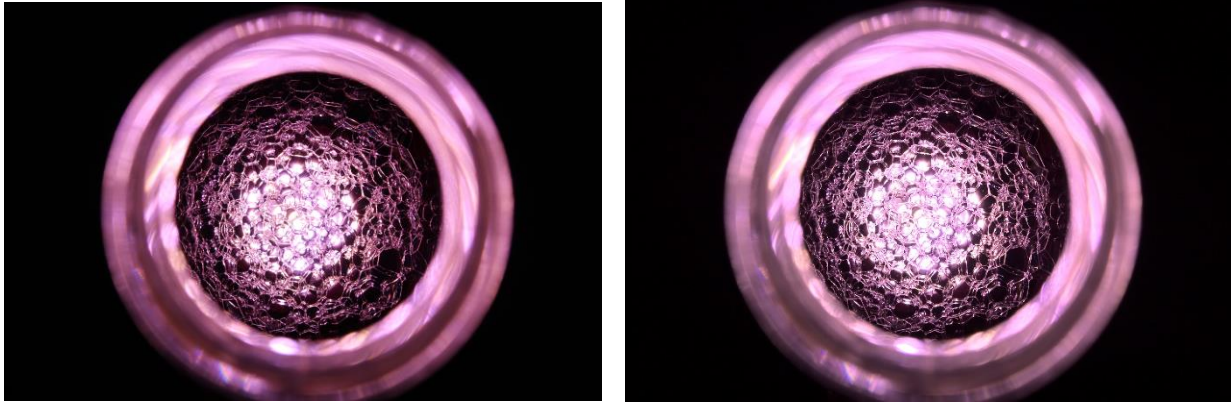


Figure. 2 Comparison between the original image at 5,000 x 3,500-pixel (left) and the edited image at 1,300 x 850-pixel (right)

I was very pleased on how my original image turned out to be. Therefore the final processed image is very similar to the original. I really liked how clear the bubbles turned out to be. I also like that I was able to get the bubbles and the container to illuminate in this pink coloration in a dark black background. A suggestion that I received from my classmates was that the light in the center is very bright. A way that I would improve this in the future would be to add a solid white paper as a boundary between the flashlight and the container to reduce the overall focus of the light. Other than this I don't think that the image needs any further improvements. All in all, I feel that the image fulfilled my intent.

References

SCHEID, C.M. "Fluid Dynamics of Bubbles in Liquid." *SciELO*, 26 Aug. 1999,
www.scielo.br/scielo.php?Script=sci_arttext.