

Team Second Report

MCEN 5151 Flow Visualization

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Introduction

I did the team second assignment with my team as shown in figure 1, this is a bubble film experiment with a diffused light. The experiment is pretty successful we can see colorful film on the bubble film and it is a lot of fun to build the equipment to do this.

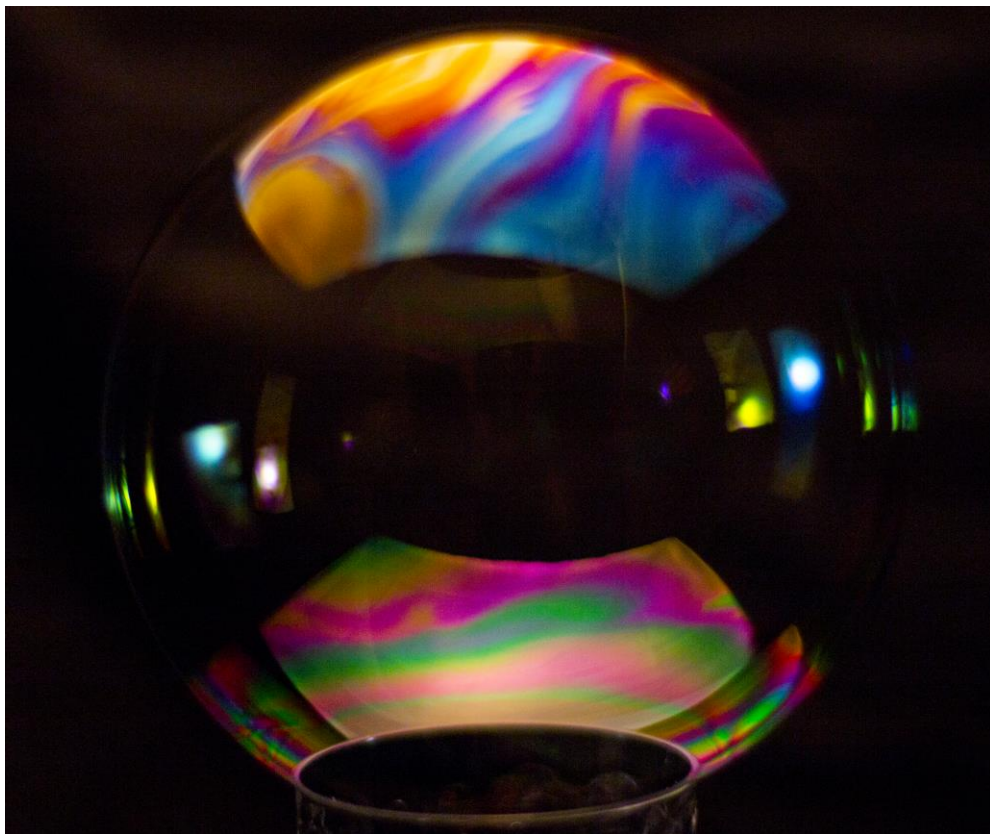


Figure 1 Bubble Film

Fluid

The bubble is generated by a glass nozzle and soap water, the bubble's surface tension is follow the pressure relationship is $P_i - P_0 = \frac{4T}{r}$ ^[2]. Which we can see higher pressure gives the bigger bubble film. Also because of the small change of pressure, film thickness would be different. Various thickness film have different surface interference, then gives different color for the soap bubble. The air has a

refractive index of 1, but bubble film has a refractive index higher than 1. So under this condition, bubble film could reflect part of light back into air as shown in figure 2.

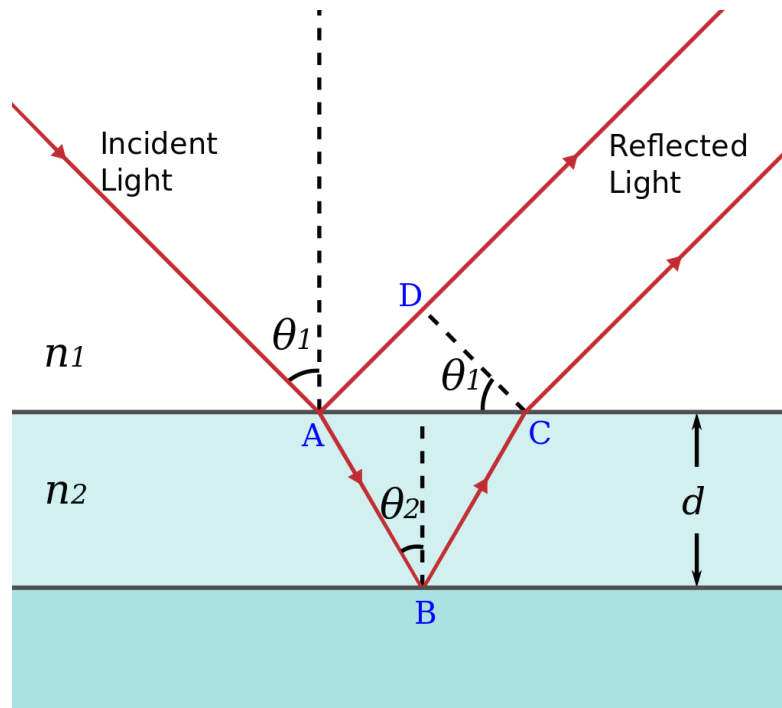


Figure 2 Soap bubble Light incident¹

Experiment Setup

The set up for this experiment is really complicated as shown in figure 3, a light dome is placed above the bubble glass with a diffuser. It was hanged by a rode which is supported by two tripods. A black back drop cloth was wrapped around the light dome. The bubble is blow inside light dome by a plastic straw on a chair. Camera is also inside the light dome and approximately 1.5 ft. away from bubble. The camera is fixed on a tripod and manually focused on the bubble. This bubble was also have two side flashlight with diffuser on both sides. We from figure 1 that it has two light point, that is cause by the side flashlight. We were expected to see more color film on bubble, but flashlight not gives interference color for the bubble film.

Image Process

The image was taking by a Canon ESO Rebel SL1 with a fixed lens 50mm. The exposure of camera is set to 1/250 second, the F-stop set to f/1.4, and the ISO is set to 100. The distance from the object is about 1.5 ft. away. The size of bubble is about 4 inches in diameter. The original image is shown in figure 4. The way I changed it is I increase the exposure of the image to make this image more visible, then increase the contract of the whole image to make it looks more colorful. I am pretty satisfied with the final image, I think our group did a good job on this assignment for all of us.

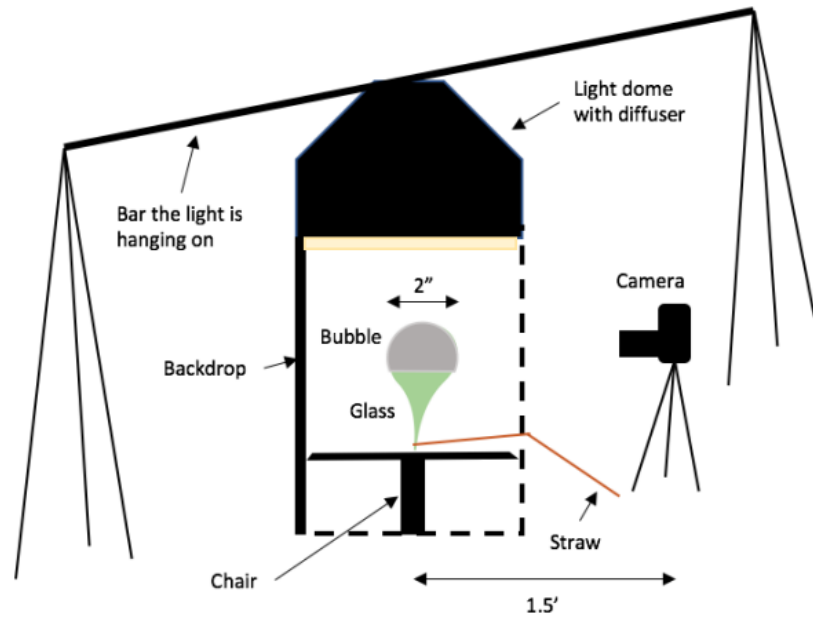


Figure 3 Experiment Setup

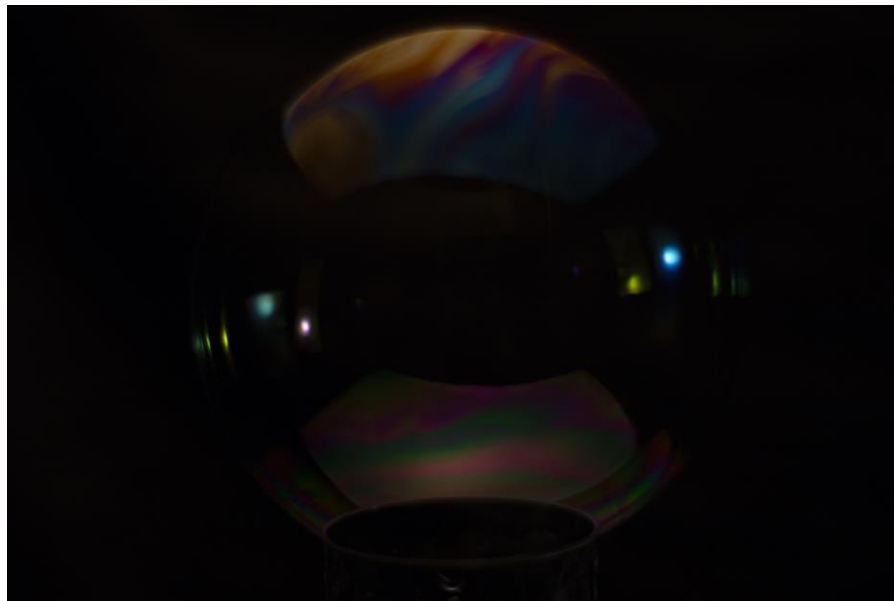


Figure 4 Original Image

Conclusion

I like my work for this assignment, it is colorful and have very good focus on the bubble, which is pretty hard to have a good focus on thin film. The dislike portion would be the background is not dark enough, if we could have a dark background I would like to increase more exposure of the image to have a better color. I would really appreciate all our team member contribute their work and idea for this experiment to make such beautiful images.

Reference

[1]. Thin-film interference – *Wikipedia*, 2018

[2]. Surface Tension and Bubbles – *C.R. Nave, Georgia State University, Hyperphysics*, 2016