

Team second report

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Flow Visualization: MCEN 4151

Experiment are fun to make, especially when there is a physics phenomenon that you are able to learn and visualize throughout the process. In this experiment, the goal was to capture, document, and describe a shear thickening fluid that has been performed with a team consists of 5 members: Matt Knickerbocker, Blake Chin, Robert Drevno, and Abhishek Kumar.

In this experiment a non-Newtonian shear thickening fluid were used to create interesting visual effect. A non-Newtonian shear thickening fluid, is a liquid with high viscosity that increases when the shear rate increase as shown in figure 1. The team used a cornstarch combined with water to create oobleck. Then, applying a strong and fast force to stir the cornstarch with water created a high shear rate with a resultant of a high shear stress. This resultant high shear stress is seen as Dilatant as shown in figure 1.

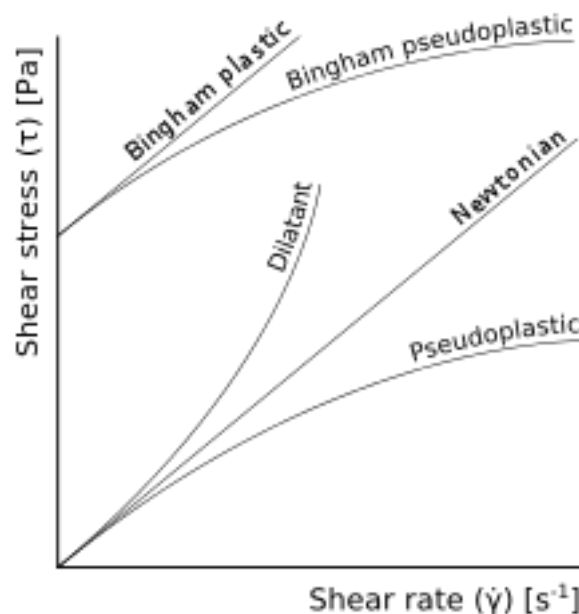


Figure 1. Non-Newtonian shear thickening fluid

To make this experiment possible, a corn starch, 1L of water, and a 6-inch diameter rounded vessel and a plastic spoon. First, a 300 mL of water were poured to the vessel, then, cornstarch was added to create oobleck mixture in a process that would be 1:1 of ratio of cornstarch to water. Finally, when we had a shear thickening fluid, a purple and yellow India ink were dropped, respectively, in small amounts and very slightly stirred to form the final image as shown in figure 3. Interestingly, the colors were seen as they float instead of being mixed with the shear thickening fluid. An experimental setup is shown in figure 2 to better illustrate the process.

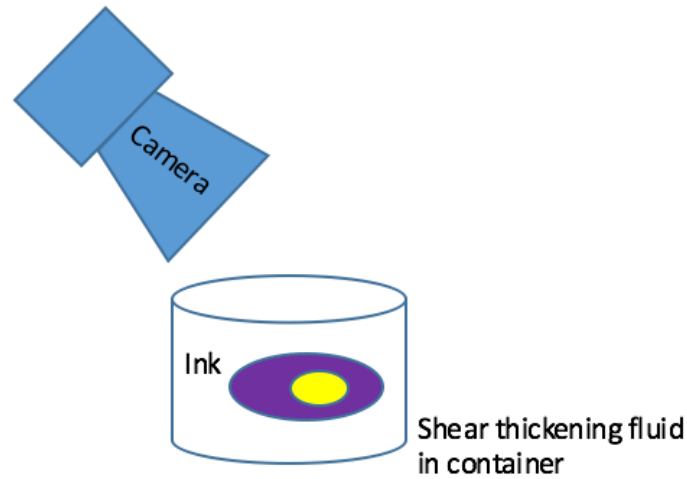


Figure 2. Experimental setup

The camera that captured the final image was a Nikon D5200 with a focal length of 200 mm. Having an exposure time of 1/125 second, ISO of 500, and aperture of F/6.3, produced the final image of dimensions 6000 by 4000 pixels. The final image was approximately 5 inches from the shear thickening fluid. Finally, a post processing of the image was done using photos in which the colors were turned up to show the boundaries between the colors and shear thickening fluid. A comparison of the final and original image is shown in figures 3 and 4 respectively.



Figure 3. Final image

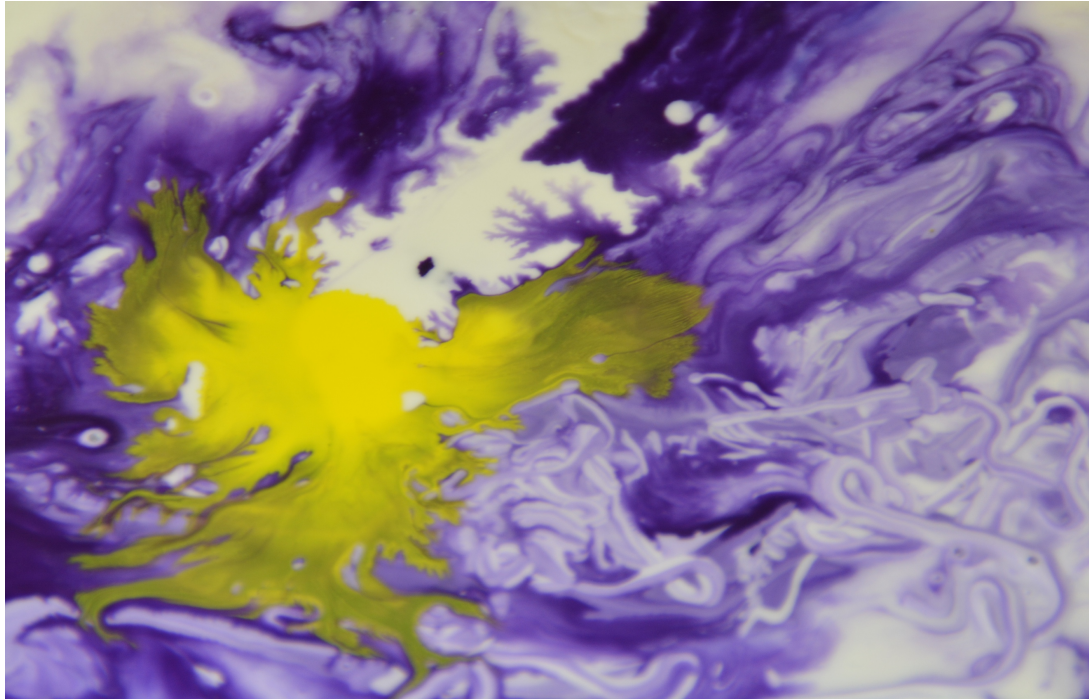


Figure 4. Original image

The final image shows how the thickening fluid can be imagined when the colors looks floating as they have different densities. I like how the mixture of the colors and the shear thickening fluid created this amazing looking image. I feel that I accomplished the intent of the experiment in which the behavior of the shear thickening fluid were realized. For future improvements, I have a larger container and variety of different colors to experiment