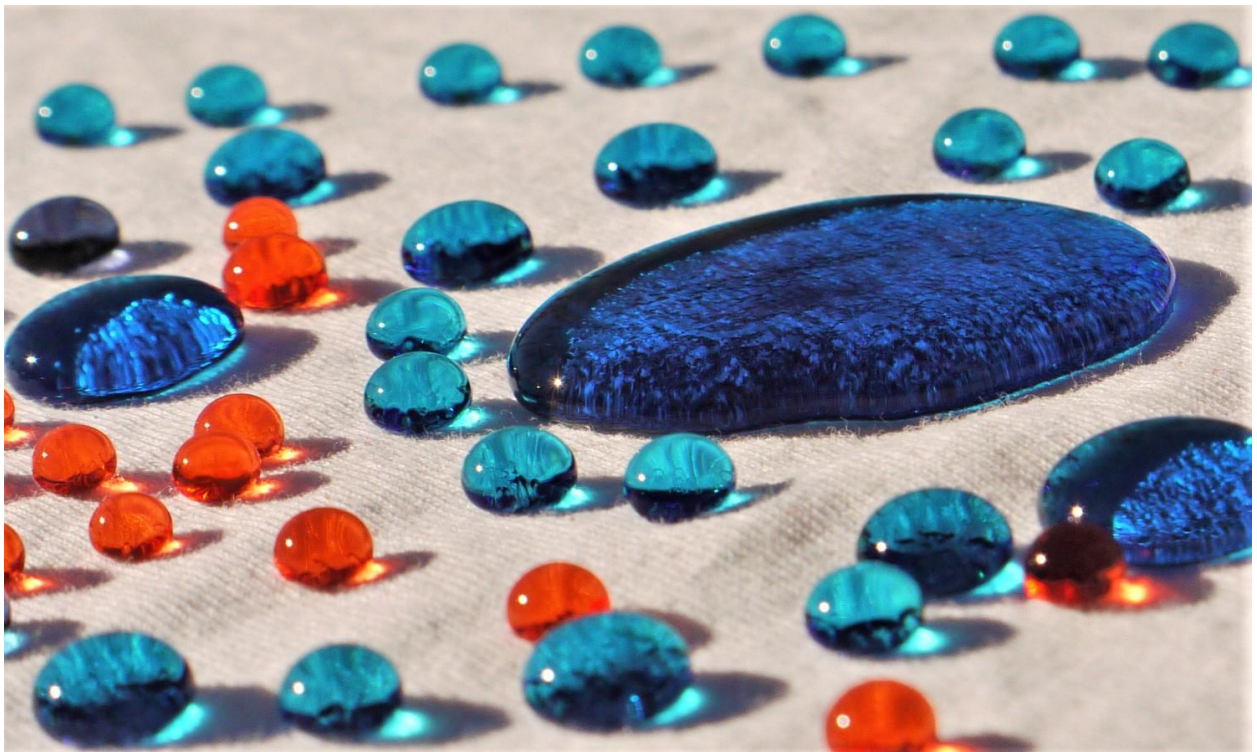Alejandro Barron Toriello

MCEN 4151: Flow Visualization

Prof. Jean Hertzberg

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Superhydrophobic Droplets

I captured this image for the "Team's Second" assignments for the course Flow Visualization. The main purpose of this task was to experiment with a superhydrophobic canvas and add colored water droplets. I decided to capture many droplets, but only have two colors of droplets. I picked those colors because I think they contrast really well; blue may be seen as a cold color while red represent hot. It was very interesting seen how we could form big droplets.

In order to create this environment, we sprayed an old white t-shirt with superhydrophobic spray (Rust-Oleum 278146 NeverWet). This was the canvas where the droplets where placed. For the droplets, I just mixed some food coloring and water in a syringe. Then with the syringe, the droplets where carefully placed on the t-shirt. This allowed me to control the size of the droplets. I specifically placed each droplet and made them a desired size for this picture. I took this picture outside at about noon which gave me excellent lighting. The camera was about 4 in from the droplets and about 30° from the surface. Figure 1 is an accurate representation on the setup.
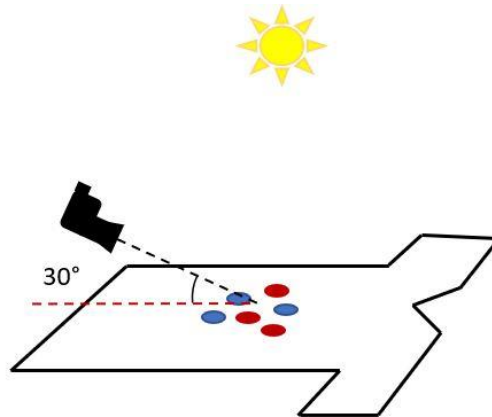

Figure 1: Setup for the photo

The reason why the water droplets are able to float on the surface is because the superhydrophobic changes the contact angle with the water to 150° or more. This decreases the surface energy which increases the surface tension on the water droplets. It was also noticeable how the surface became rougher as the t-shirt stiffen up with the spray. Surface roughness allows more air bubbles which creates barriers. Thus, those are the main reasons why the droplets are floating on the surface.

For this assignment I used a Panasonic DMC-GF1 with a lens that has a focal length of 33mm. I set my exposure time to 1/2000 sec and my ISO at 400. Also, since the environment had a lot of lighting, I set my f-stop to f/10. The image has a dimension of

4000x2248 pixels. For this shot, I specifically focused on the big droplet and due to the angle, the camera was at some of the other droplets were out of focus which I think made this shot unique. I didn't do much post processing other than just adding some exposure light and cropping the photo. Figure 2 is the raw photo before it was finalized.
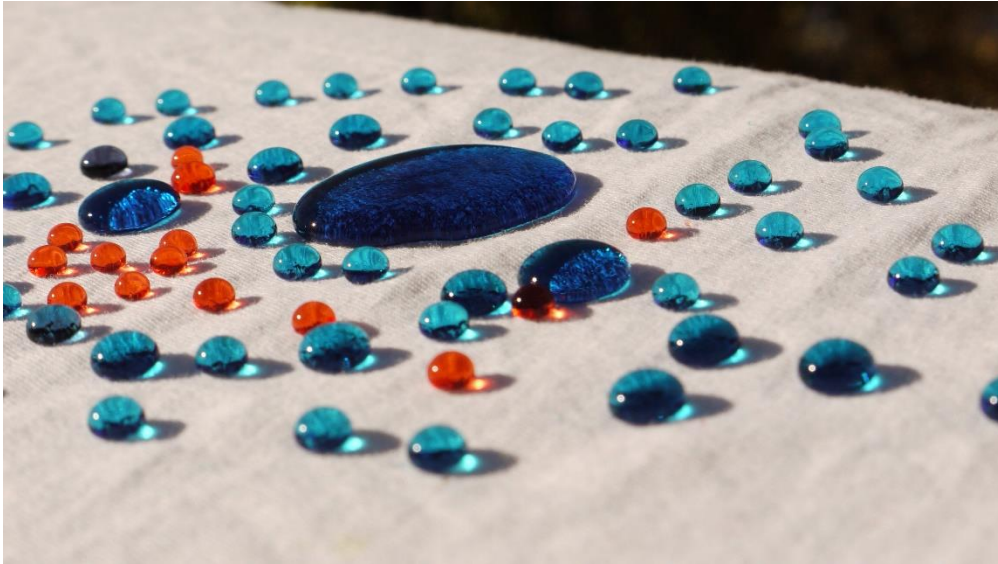
Figure-2: Raw picture before editing

References

Ma, Minglin, and Randal M. Hill. "Superhydrophobic Surfaces." *Current Opinion in Colloid & Interface Science*, vol. 11, no. 4, 2006, pp. 193–202., doi:10.1016/j.cocis.2006.06.002.

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https://www.lawrencehallofscience.org/sites/default/files/pdfs/college_resources/modules/Superhydrophobic/Superhydrophobic_Surfaces.pdf

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