

# Electrostatic Induction of Water



<https://www.youtube.com/watch?v=JJKizGFoH0>

Flow Visualization

MCEN 4151

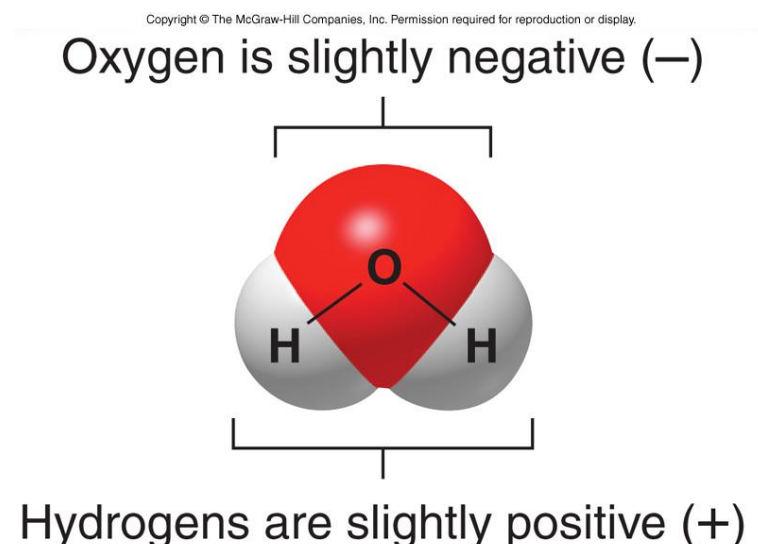
Team Third

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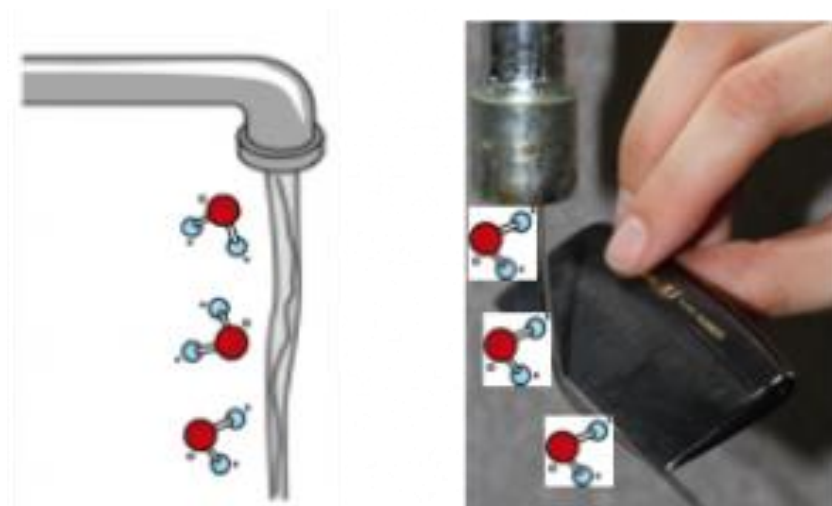
Youngwoong Kim

I produced a video which is named as 'Electrostatic Induction of Water'. The reason I chose 'Electrostatic Induction of Water' as the title of my video is that the water molecules are induced by rubbed plastic straw. The phenomenon I was trying to see in my video is that the water pops up due to the electrostatic induction by plastic straw. The container contains a cup of water until the surface tension of water breaks. The plastic straw is rubbed by a piece of tissue to make electrostatic induction into the plastic straw. Then, the plastic straw gets closer to water and the water would pop up in short amount of time.

The flow apparatus is self-explained by final video. The main flow in this set-up is the motion of water in the container. The water was fully filled in the container by using the surface tension of water. I figured out only in this case, it was much easier to find the motion of water due to electrostatic induction by eyes on the screen.



*Figure 2: The Picture of Polar Molecule with Two Hydrogen and One Oxygen*



*Figure 2: The Behavior of Water Molecule during Process of Electrostatic Induction*

Figure 1 shows the evidence of water molecule is polar. Oxygen has a very strong attraction for electrons, so when oxygen is sharing electrons with two hydrogen atoms, it gets the negative electrons slightly more than its fair share of the time. Since the negative electrons are near the oxygen end, more of the time, the oxygen is slightly negative. The hydrogen ends of water are slightly positive because the hydrogen atoms each have a positively charged proton that is left by itself when oxygen is sharing the electrons unfairly. If a plastic straw is inducted into negative electron, the positive side of water molecule would tend to attract to the plastic straw which contains opposite polarity. Figure 2 shows how the water molecule looks like when they are electrostatically inducted.

I have used water, plastic straw, paper cup, and tissue as the visualization techniques. The water is just tap water, the plastic straw is from Tervis, the paper cup is from Dixie, and the tissue is from Puffs. The number of lightening source that I have used is just one. The lightening source is come from ceiling which is placed above the object. The music that is used in the video is no copyright background music provided by Youtube. The link

of background music is at the reference section.

I have tried variety types of induction object, and I figured out that the type of induction object, which is a plastic straw, is just appropriate for showing the motion of water. I wanted to show the container at the center of video and the frame of video is symmetric, so I have decided the distance from object to lens as about 10 cm. I have used iPhone as my shooting method, and iPhone has two different lenses which are wide-angle lens and telephoto lens. The wide-angle lens measures 28 mm, and the telephoto lens measures 56 mm. From the EXIF data, we know that the focal length is 3.9 mm. The camera specifications are 1080p at 60 fps, 7 MP, f/2.2 and 32 mm. I reduced video quality to 720p from 1080p due to the size of video by using iMovie. The range of ISO setting of iPhone is 32 to 1600, but I chose to use ISO 1600 because I want to keep my video quality as high as I can.

In my opinion, the video came out well. It captured the behavior of water molecule. I could find that the behavior of water obeyed the laws of physics which is electrostatic induction. My question is how strong the electrostatic induction between water and plastic straw and how much gravity affected on my project. I think that I fulfilled my intent by showing beautiful flow movement. I think that it would be a significant improvement if I put pure black background to see the movement of water.

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Reference:

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2. E. (2017, February 01). *Best Documentary Background Music For Videos | Cinematic Music*. Retrieved from [https://www.youtube.com/watch?v=\\_PybCKpaw3U&t=0s&list=LLcmq6FG3ECrIjJq41wO-vg&index=1](https://www.youtube.com/watch?v=_PybCKpaw3U&t=0s&list=LLcmq6FG3ECrIjJq41wO-vg&index=1)

3. *Exploring Our Fluid Earth*. (n.d.). Retrieved from <http://manoa.hawaii.edu/exploringourfluidearth/chemical/properties-water/types-covalent-bonds-polar-and-nonpolar>