**Density Lava Lamp**

You know the mesmerizing feel of watching a lava lamp, with its large colored bubbles sinking and rising and morphing. With this project, you can make your own (temporary) lava lamp with household materials! It's easy and safe, and it looks very cool.

Materials:

* [**Flask**](http://www.hometrainingtools.com/flask-erlenmeyer-250-ml/p/CE-FLAI250/)
* Vegetable oil
* Water
* [**Food coloring**](http://www.hometrainingtools.com/food-coloring/p/CH-FOODCOL/)
* [**Alka-seltzer**](http://www.hometrainingtools.com/alka-seltzer-tablets-2-pk/p/CH-ALKASEL/)

What to do:

1. Fill the flask most of the way with vegetable oil.
2. Fill the rest of the flask with water. The water will sink to the bottom under the oil.
3. Add a few drops of food coloring; your choice of color. The food coloring is water-based, so it will also sink and color the water that is now at the bottom of the flask.
4. Break an alka-seltzer tablet into a few small pieces, and drop them in the flask one at a time.
5. Watch your lava lamp erupt into activity! As the reaction slows down, simply add more alka-seltzer.

What's happening?

A lava lamp works because of two different scientific principles, density and polarity.

* **Density** is the measurement of how compact a substance is - how much of it fits in a certain amount of space. (The scientific equation is **density = mass/volume**.) If you measure an equal volume of oil and water, you'll find that the water is heavier than the same amount of oil. This is because water molecules are packed more tightly and a cup of water actually has more mass than a cup of oil. Because water is more dense than oil, it will sink to the bottom when the two are put in the same container. Density is affected by temperature—the hotter a liquid is, the less dense it will be.
* Even though they have different densities, oil and water would eventually mix together if it weren't for **polarity.** Water molecules are "polar" because they have a lopsided electrical charge that attracts other atoms.  The end of the molecule with the two hydrogen atoms is positively charged. The other end, with the oxygen, is negatively charged. Just like in a magnet, where north poles are attracted to south poles ("opposites attract"), the positive end of the water molecule will connect with the negative end of other molecules. Oil molecules, however, are non-polar— they don't have a positive or negative charge, so they are not attracted to the water molecules at all. This is why oil and water don't mix!

Real lava lamps use a polar and non-polar liquid just like our homemade one did. In a real one, however, the densities of the liquids are much closer together than vegetable oil and water. The denser liquid sinks to the bottom, but the lava lamp light heats it up until it expands and becomes less dense, causing it to rise upward. As it gets farther from the light, it cools down, becoming more dense again until it sinks; then the cycle starts all over.

Instead of using a light, in our homemade lava lamp we used alka-seltzer to power the lamp. The alka-seltzer reacts with the water to produce carbon dioxide gas bubbles. These stick to the water droplets. The water/gas combo is less dense than the oil, so they rise to the top of the flask. At the top, the gas bubbles pop and escape into the air, allowing the dense water to sink back to the bottom again.

Lava lamps powered by heat are trickier to make and can use more hazardous materials. You can experiment fairly safely with things like rubbing alcohol and mineral oil or lamp oil. See if you can make a lamp powered by heat!