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Glowing Lava Lamp

I. Introduction

Organic chemistry is all around us. Most of the time, it exists in forms invisible to the naked eye, but often times, it manifests itself in physical properties that are clearly visible to all. Why do oil and water not mix? Why do some compounds glow under UV light? These are physical properties that can easily be observed, but are not entirely understood. The purpose of this experiment is to explore some organic chemistry concepts, such as hydrophobicity and hydrophilicity, and molecular structure, to provide an understanding of just how widespread organic chemistry is and how it affects so many aspects of the visible world around us.

The first thing that will be examined in this lab is the concept of hydrophobic and hydrophilic. Hydrophobic literally means "to fear water", or in chemistry terms, to repel water resulting in a failure to mix in water. Oils and fats tend to be hydrophobic, and more importantly non-polar. This means that they do not have an overall charge, but are neutral. Hydrophilic means "water loving," and describes a compound's ability to completely dissolve or mix in water. Hydrophilic compounds tend to be polar, meaning they tend to carry a charge on a molecule. These two concepts are very important in organic chemistry as they form the backbone of the key concept of "like dissolves like." This means that a polar substance cannot be dissolved in a non-polar substance. Water is a polar substance, and as stated earlier, oils and fats tend to be non-polar. This is why a greasy cooking pan cannot be cleaned with water alone. The final organic chemistry concept that will be explored is how the molecular structure of a compound affects its physical properties. The molecular structure, or how a molecule is put together, is extremely important in organic chemistry. The structure of a molecule affects how it will react, and in this experiment, the structure gives a compound the visible characteristic of fluorescence, the ability to emit light. In this experiment, these concepts will be visible in the construction of a glowing lava lamp. The hydrophobic oil will act as lava, floating freely in the water, but never dissolving or mixing. Under a UV light, the fluorescence of the compound, the result of alternating double and single bonds, will be on display by emitting light or "glowing" when exposed to UV light.

II. Supplies

- Empty 8 oz. water bottle with sport top
- 2 fluid ounces of Tonic Water
- 5.5 – 6 fluid ounces of vegetable oil
- 1 Alka-Seltzer™ tablet cut into fourths
- 3 drops of food coloring

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- UV light

III. Procedure and Questions

1) Add 5.5 – 6 fluid ounces of vegetable oil to the empty water bottle

2) Add 2 fluid ounces of tonic water to the bottle. What happens when you add the water? Why does this happen?

3) Add 3 drops of food coloring. Does the food coloring mix with the water? Shake the bottle to mix the color throughout.

4) Cut 1 Alka-Seltzer™ tablet into fourths, and add 1 -2 pieces to the bottle. Making sure the sport cap is closed, turn the bottle upside down to allow the Alka-Seltzer™ to mix. Once the bottle is upright, make sure to pull the sport cap to allow any gas that has formed to escape.

5) Once mixed, put the bottle under a UV light. What happens? Why does this happen?

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