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CHEM-124-L07 LAB CWID: 20324717

September 24, 2014

Paper Chromatography

**Objective:**

The purpose of this experiment was to use chromatography, a technique of separating mixtures physically, to separate multiple substances and determine their respective response factors.

**Procedure:**

Three rectangular strips of Whatman filter paper were obtained, and a line was drawn across the long end approximately 2 centimeters from the bottom for each paper. A small amount of 2% salt solution was placed in a clean beaker. The level of the solvent was about 1.5 cm from the bottom. To speed up the process, two more identical beakers were filled with the salt solution to the same level. The strips of filter paper were then marked with a three substances. Four different colors of food coloring were placed onto one filter paper using a toothpick, and each pigment spot was marked with the color name. This was also done with dye removed from the shell of six different colored M&M candies. The process was then repeated using four water-based markers as a coloring medium. After the initial markings were placed, the filter papers were rolled up and stapled at the edges, and placed inside each of the filled beakers. The beakers were covered with a watch glass and the solutions were left to travel up the filter paper for at least 15 minutes. After the solvent stopped moving, the filter papers were removed and the measurements were recorded.

**Specialized Chemical Technique:**

The process of chromatography was practiced with the use of specialized filter paper and various pigments.

**Final Result:**

The data from this experiment provided for several trends. The initial trial involving food coloring provided for the following food color and Rf value combinations: red = .27, green = .66, yellow = .44, blue = .71. The green dye was composed of both yellow and blue dye, and dye that included the blue pigment had significantly higher Rf values compared to others. The lowest Rf value of M&M was .22 for the red dye, and the highest (.75) for the yellow dye. The highest Rf value for the water-based marker was .79 for the blue marker.

**Conclusion:**

Individual colors could be recognized as containing the color blue as they had the greatest Rf value compared to other colors. The blue dye therefore is more polar compared to dyes such as red, as it is more soluble in the salt solution compared to the other dyes.

**Attachments:**

* Chromatography Sample (M&M coloring)
* Report Questions
* Recorded Data

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Paper Chromatography Report Questions

Table 1: Food Coloring

|  |  |  |  |
| --- | --- | --- | --- |
| **Food Color** | **Distance Dye Travelled** | **Distance of Solvent** | **Rf Value** |
| red | 2.5 | 9.0 | .27 |
| green | 6.0 | 9.0 | .66 |
| yellow | 4.0 | 9.0 | .44 |
| blue | 6.4 | 9.0 | .71 |

Table 2: M&M Coloring

|  |  |  |  |
| --- | --- | --- | --- |
| **M&M Color** | **Distance Dye Travelled** | **Distance of Solvent** | **Rf Value** |
| brown | 3.7 | 9.0 | .41 |
| orange | 2.4 | 9.0 | .27 |
| red | 2.0 | 9.0 | .22 |
| green | 3.5 | 9.0 | .39 |
| blue | 4.5 | 9.0 | .50 |
| yellow | 6.8 | 9.0 | .75 |

Table 3: Marker Coloring

|  |  |  |  |
| --- | --- | --- | --- |
| **Marker Color** | **Distance Dye Travelled** | **Distance of Solvent** | **Rf Value** |
| yellow | 6.0 | 10.0 | .60 |
| pink | 6.3 | 10.0 | .63 |
| orange | 6.0 | 10.0 | .60 |
| blue | 8.1 | 10.2 | .79 |

2). The solvent that was used for the final two separations was the 2% salt solution as it was the only solvent available.

3). Substituting the M&M colors for the Kool-Aid dyes, the dyes in the M&Ms were slightly different from the food coloring dyes. The red colored M&M had an Rf value of .22, while the red food dye had an Rf value or .27, which is very close to the former dye. The other tested colors had large differences in Rf values, and should not be considered to be the same as their respective counterparts. The red and orange colors of the M&M shared similar values, which means that they might contain the same dyes.

4). N/A

5). See above table.

6). Gasses such as Oxygen and Nitrogen can be considered nonpolar substances as they will not dissolve in a polar substance such as water.

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