**Abstract**

The purpose of this experiment was to study temperature changes caused by the evaporation of several liquids, related to the strength of intermolecular forces of attraction, and using the results to predict the temperature change for other liquids. This experiment was conducted by placing temperature probes in various liquids and once removed recording the temperature decrease. Key results included predicting the temperature change for methanol to be 8.13 °C and hexanol to be -0.396 °C.

**Introduction**

This experiment investigated how the change in temperature caused by evaporation can lead to an understanding of the strength of intermolecular forces of attraction. This was done to discover how intermolecular forces and their strengths coincide with temperature. Conducted by recording the temperature that the liquids evaporated and measuring their change.

**Procedure**

First, the probe was connected to the computer and the Logger Lite software was opened and set up to collect the data. Next, the probe was wrapped with a square piece of filter paper, in the shape of a cylinder, and secured with a small rubber band. Then, the probe with the filter paper wrapped around it was placed into one of the liquid solutions for 30 seconds. Once completed, the probe was pulled out of the solution and the collection began by clicking collect on the Logger Lite software. The program monitored its initial temperature and was stopped once it reached the minimum temperature. Then, the statistics button gave the data for the maximum (T1) and minimum (T2) values for the liquid. T1 and T2 were then subtracted to determine the temperature change during evaporation. The filter paper was disposed of in the trash and the procedure repeated for the remaining liquids.

**Results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Substance | Formula | Molar Mass (g/mol) | Boiling point (°C) | List IMFs (LDF, D-D, H-bond) |
| n-pentane | C5H12 | 72.17 g/mol | 36.1 °C | LDF |
| 1-propanol | C3H7OH | 60.11 g/mol | 97 °C | LDF, D-D, H-bond |
| 1-butanol | C4H9OH | 73.13 g/mol | 117.7 °C | LDF, D-D, H-bond |
| 1-pentanol | C5H11OH | 87.16 g/mol | 138 °C | LDF, D-D, H-bond |
| 2-pentanone | C5H10O | 86.15 g/mol | 101 °C | LDF, D-D |

|  |  |  |  |
| --- | --- | --- | --- |
| Substance | T1 (max) (°C) | T2 (min) (°C) | ΔT (T1 – T2) (°C) |
| n-pentane | 25.51 °C | -2.554 °C | 28.064 °C |
| 1-propanol | 24.72 °C | 20.41 °C | 4.31 °C |
| 1-butanol | 24.48 °C | 20.55 °C | 3.93 °C |
| 1-pentanol | 25.23 °C | 24.18 °C | 1.05 °C |
| 2-pentanone | 23.75 °C | 17.91 °C | 5.84 °C |

**Discussion**

*The results found during this experiment are reasonable. After conducting the experiment, the liquid with the strongest intermolecular forces was found to have the lowest change in temperature. This was 1-pentanone and was found to have only a change in temperature of 1.05* °C. *This is because the stronger the intermolecular forces the more time it would take to evaporate the liquid. The weakest intermolecular forces were found in the liquid n-pentane with a change in temperature of 28.064* °C*. By looking at the graph found in the results above, the trend line shows this as well. With the change in temperature decreasing the higher the molar mass is. This experiment also investigated three different alcohols. All of these alcohols have the same intermolecular forces but vary in their change in temperature. This is due to the differences in their molar masses.*

**Conclusions**

*In conclusion, this experiment was able to discover that the liquid with the strongest intermolecular forces was 1-pentanone and the one with the weakest was n-pentane. These results provide important information about the connections between the change in temperature, intermolecular forces, and the molar mass.*