**Abstract**

Alcohol and alkane liquids were evaporated on a temperature probe to determine a temperature change value for each liquid. Pentane, propanol, butanol, pentanol, and pentanone were each tested and through their temperature change values their intermolecular forces were related. Pentane had a temperature change of 25.4 oC and was deemed to have weakest intermolecular forces, 1-pentanol had a temperature change of 0 oC and was deemed to have the strongest intermolecular forces.

**Introduction**

In this lab we were investigating the magnitude of temperature decrease for various alcohol and alkanes solutions. We tested 5 solutions using a temperature probe and evaporation as our medium for finding the temperature decrease. Our reason for finding the temperature decrease was because it is directly related to the strength of the intermolecular forces of attraction that each alcohol has. Understanding which liquids are subject to stronger or weaker IMFs allows us to also predict the temperature change for other liquids.

**Procedure**

Once the probe and Logger Lite software had been setup the tip of the probe was wrapped with a piece of filter paper and secured. The probe was placed in the liquid solution that was being tested and left in for at least 30 seconds. The data collection button was pressed on the software at this point, once a stable initial temperature had been determined the probe was removed from the liquid and held over the beaker the liquid was in. Once the temperature stabilized at a minimum the stop button was pressed on the software. Both the initial (max) and final (min) temperatures were recorded for the specific liquid being tested and the change in temperature was calculated and recorded. The procedure was repeated for each of the liquids tested.

**Results**

|  |  |
| --- | --- |
| **Substance** | **△T (oC)** |
| n-pentane | 25.4 |
| 1-propanol | 4.9 |
| 1-butanol | 5.0 |
| 1-pentanol | 0.0 |
| 2-pentanone | 8.8 |

**Discussion**

There is such a large difference between the ΔT values of n-pentane and 1-butanol due to the two liquids having different intermolecular forces. Due to the oxygen atom present along with its polarity 1-butanol is subject to hydrogen bonding, dipole-dipole interaction, and London dispersion forces. However, n-pentane has only London-dispersion forces since it is non-polar and has no atoms suitable to form hydrogen bonds with the hydrogen present in its structure. Of the three alcohols studied 1-pentanol appears to have the strongest intermolecular forces due to its change in temperature of 0 oC. 1-propanol and 1-butanol appear to have very similar strength intermolecular forces. All three of these alcohols are subject to hydrogen bonding forces however it seems that 1-pentanol has the strongest of these hydrogen bonds. I would expect methanol to have a high ΔT value compared to the other alcohols due to the lack of hydrogen atoms in its structure. I would expect hexanol to have a ΔT value very close to zero due to the prevalence of hydrogen atoms in its structure. Of the three liquids that were ranked, n-pentane has the weakest intermolecular forces, followed by 2-pentanone, and 1-pentanol has the strongest.

**Conclusion**

Various alcohol and alkane liquids were tested to see what their temperature change would be due to evaporation. The alkane liquids were found to have the highest change in temperature and thus the weakest intermolecular forces. Of the alcohols, pentane had the least change in temperature at 0 oC and thus the strongest intermolecular forces. By understanding both the structure and size of the molecules being tested it allowed us to explain the various ranges of temperature changes across similar liquids.