Lab report #2 – Experiment 3, Determination of Melting Points and Boiling Points

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Objective : Using boiling apparatus, determine the boiling & melting points of the objects. In this experiment, it is necessary to use Mel-temp unit for the MP, and magnetic stirring hot plate for the BP.

Procedure : p.6~7, p.10 of the lab note.

Data table of Melting Point (℃)

|  |  |  |
| --- | --- | --- |
|  | Compound | Mixture with Unknown compound |
| Unknown | 118-119.5 |  |
| Compound 1(Acetanilide) | 108-110 | 114-116 |
| Compound 2(Benzoic acid) | 120-123 | 118.5-119.5 |
| Compound 3(Benzamide) | 125-126 | 119-121 |

(Data Table 1) Room Temp : 25.3℃

Data table of Boiling Point (℃)

My own Data

BP of unknown liquid : 66

BP of known liquid (n-propylalchol) : 98.5

Room Temp : 25℃

Data from others (℃)

|  |  |
| --- | --- |
| 1C | 65.8 |
| 2C | 82.3 78.5 |
| 3C | 98.5 96.4 96.6 97.7 97.2 96.7 98.2 96.6 |

(Data Table 2)

Calculations

Average value of Boiling Point (℃)

|  |  |
| --- | --- |
| 1C | 65.8 |
| 2C | 80.4 |
| 3C | 97.3 |

(Data Table 3)

Discussion

Theory

1. Melting Point has a narrow range. When it changes its crystal state to liquid, it’s ‘Melting Point.’ Be careful not to mix with other materials like dust.
2. When the vapor pressure is bigger than the atmospheric pressure, it is ‘Boiling Point.’ The material starts to make bubbles and escape from the liquid rapidly. In this experiment, we ignore the range of the BP.
3. When a compound mixes with other compounds, MP decreases.

Reporting

1. Actual Data : refer Data Table 1,2
2. Graph : attached with average value
3. Interpretation of data
   1. Identifying the solid

The closest value in materials in lab was Benzoic acid. The error was 0.5~5℃. The ‘mixture’ with unknown material shows very similar range. I think the unknown material was Benzonic acid.

* 1. Identifying the liquid

Gaps of 1C, 2C, 3C’s value are pretty big. And we got 66℃ for an unknown liquid, so without doubt, I assume it is 1C which is methanol.

1. Literature Value
   1. Benzoic Acid : 122.41℃
   2. Acetanilide : 114.3℃
   3. Benzamide : 127-130℃
   4. Methanol : 64.7℃
   5. Ethanol : 78.37℃
   6. 1-propanol(n-propyl alcohol) : 97-98℃

Summary & Conclusion

With the given table and large gaps, it was not hard to determine the solid and liquid. The solid I got(Unknown A) was Benzoic Acid, and unknown liquid I got was Methanol. Making mixture helps me to determine materials. I can assume that it is same material if I mix two materials and the MP doesn’t decrease. This experiment is simple, but I made too big range. I think I need more exercise for narrow range. For chemists, MP and BP should be important property to determine what it is. If we got something from nature, we can practice those experiments and assume its identity.

Post-lab questions

1. I got smaller value than actual value of MP. Is that because of dusts that cause decreasing of MP?

Postlaboratory Problems

1. Vaporized liquid comes out when it is hot enough. If it is above the BP, it will continue to come out.
2. I think it is because it’s just an exact time that temperature of liquid meets the MP. Bubble starts means vapor pressure is same as atmospheric temperature. If I measure late, it can be the temperature which is overheated.
3. Air changes phase to liquid when the molecules move slowly and need less space. If the nitrogen has too much thermal energy which more than -196℃, it cannot be liquid because it’s too actively move. When pressure is larger, the molecule can liquefy in higher temperature because external atmospheric force keep the material in structure.