# An Ice Pack Maintaining Coldness

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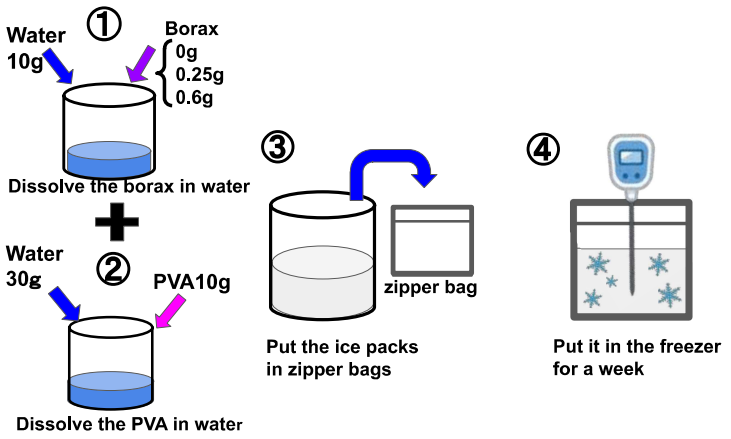
## Purpose

Check whether the borax contained in the ice pack is related to its coldness.

## Experiment1 Comparison by Borax amount




## (1)Results・Considerations

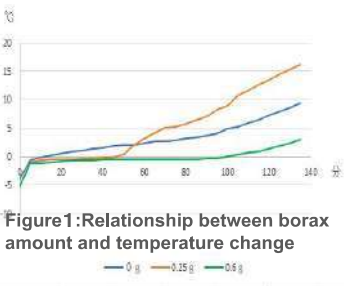
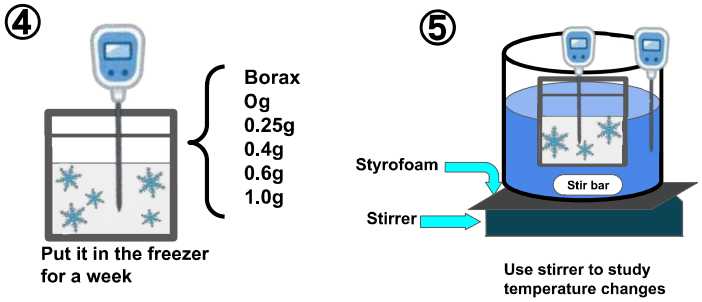


Figure1:Relationship between borax amount and temperature change

【Results】
・The highest coldness→Borax 0.6g
・Borax 0.25g
→Sudden temperature rise
【Considerations】
Borax 0.25g
→Cross-linked bridge is weak

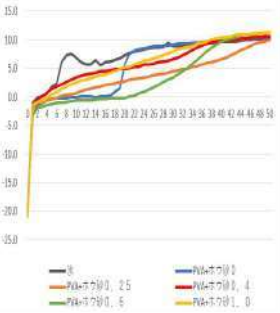
## Experiment2Comparison by water temperature




## (2)Results・Consideration

### Inside

| | Melting start time | Melting end time | Time taken to melt | Slope of the temperature rise after melting(℃/min) |
|---|---|---|---|---|
| Water | 9 | 16 | 7 | 0.105 |
| Borax0 | 9 | 16 | 7 | 0.219 |
| Borax0.25 | 6.71 | 10 | 3.29 | 3.290 |
| Borax0.4 | 2.87 | 4 | 1.13 | 0.211 |
| Borax0.6 | 21 | 23 | 2 | 0.453 |
| Borax1.0 | 4.4 | 6 | 1.6 | 0.246 |

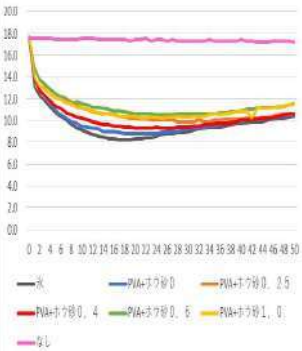


【Results】
・The lowest temperature
→Borax0.6g
・Sudden temperature rise
→Borax0.25g
【Considerations】
・High concentration
→ The dissolution time is the shortest
・Borax 0.6g
→The melting start time is late
・Borax 0.25g
→Sudden temperature rise

### Outside

Threshold0.05℃

| | Temperature decreasing period | | Temperature fixing period | | | Temperature increasing period |
|---|---|---|---|---|---|---|
| | Decreasing period(min) | Downward slope(℃/min) | Average temperature | Standard deviation | minute(min) | Slope (℃/min) |
| water | 15 | −0.43 | 8.3 | 0.053 | 6 | 0.069 |
| Borax0 | 17 | −0.38 | 8.8 | 0.044 | 8 | 0.065 |
| Borax0.25 | 23 | −0.22 | 10 | 0.051 | 13 | 0.043 |
| Borax0.4 | 18 | −0.30 | 9.3 | 0.052 | 12 | 0.060 |
| Borax0.6 | 20 | −0.22 | 11 | 0.045 | 15 | 0.055 |
| Borax1.0 | 26 | −0.16 | 10 | 0.053 | 7 | 0.063 |



【Results】
・Borax 0g／Ice
→The temperature decreases suddenly and drops to a low temperature, but the time period is short
・Borax 0.25g／0.4g／0.6g
→Slow temperature decreases, the temperature is not so low, but time period is long
・Borax 1.0g
→Slow temperature decreases,temperature is not so low, and time period is short
【Considerations】
・The more free water there is, the lower the temperature will be
・If the thermal conductivity is high, the temperature will drop rapidly
・If the gel is stable, the period will be longer

## Prospects

・Improve reproducibility
・Measure stirrer heat generation
・See if the number of refreezes is related to temperature changes

## References

食用以外の塩の利用方法に関する検討ー飲料容器等にフィットする保冷材について　海水総合研究所
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