



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

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Project Title
The Effects of Different Solutes and Solution Concentrations on the Boiling Point of Solutions

Abstract

Objectives/Goals

Each solute has different molecular properties that make them boil differently (colligative properties of solutions). This experiment is to see the difference between sucrose (sugar) and NaCl (salt) solutions. The sugar molecule is non-ionic and pretty big molecule. The salt molecule is ionic and electrolytic and is light and dense. This experiment will look at the different boiling and vapor point behaviors of different solutes at different concentrations to see the different reactions, times and boiling points.

Methods/Materials

- 2 gallons of distilled water
- 321.12 grams of sugar(sucrose)
- 452.5 grams of salt non-iodized (NaCl)
- Pot, stove, thermometer
- 1. Heat 4 cups (0.946 L) distilled water in a pot with a thermometer suspended in the center
- 2. Every 15 seconds read and record the temperature until the water stops getting hotter four consecutive times
- 3. Observe and make note of the appearance of the water each time the temperature is recorded.
- 4. Plot the results on a graph with the temperature on the vertical axis and the time of the horizontal axis. Note the vapor point (when vapors form) and boiling point (when temperature remains constant)
- 5. Repeat and record with 5%, 10% and 25% solutions of NaCl and Sucrose

Results

Sucrose (sugar) had little affect on the boiling point because the structure of the sucrose is very solid, with 11 carbons. There is no ionic or electrolytic reaction as the solution boils. Therefore, the sugar behaved much like the control group, water. The NaCl (salt) solution was dramatic with lots of bubbles and crystals. The reaction went much faster, with a steeper curve in rise of temperature. The solutions with 5% concentration went much faster than solutions than 10% and 25% (except 10% NaCl).

Conclusions/Discussion

All solutes are not the same. Salt forms salt crystals, is ionic and electrolytic and has little vapors and lots of big bubbles. There were also less vapors and water loss. The sucrose solution, which was more "thick" with lots of small bubbles and tons of vapor and water loss, behaved like the water. Depending on how you want to effect the boiling point, choosing a solute can change how long it takes to boil and how much it takes to boil.

Summary Statement

This project shows how the properties of different solutes affect the boiling point of their solutions in water. I chose to use an ionic and a non-ionic compound. By using a series of concentrations I could clearly see each solute's properties.

Help Received

Mother helped me with calculations we found on the internet and to make this application