CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
J0509

Project Title
Acid Ice: The Effect of pH on the Freezing Point of Water

Abstract

Objectives/Goals
My objective was to determine if pH has an effect on the freezing point of water. My hypothesis was that a lower pH would lower the freezing point of water.

Methods/Materials
4 groups of 4 beakers were filled with 200mL of distilled water. 0.6mL of citric acid was dissolved in one group, 2.5mL in another, and 5mL in another. The last group, the control, was left as pure water. I measured the solutions# pHs and they were 6.2, 6.1, and 6.0, respectively. Pure water had a pH of 6.4. I placed the groups in the freezer (25° F) and checked them every 10 minutes (min.) for frost. I assumed that there was a correlation between when the solutions froze and their freezing point. Those that took the longest time to freeze had the lowest freezing points.

Results
The average freezing times were as follows: pure water froze first in 95 min., the .6mL group froze in 120 min., the 2.5mL group froze in 125 min., and the 5mL group froze in 170 min. This means that the 5mL group has the lowest freezing point.

Conclusions/Discussion
The results confirmed my hypothesis that solutions with lower pH freeze at lower temperatures than solutions with higher pH. After researching my topic, however, I realized that salt water, pH 7, also froze at a lower temperature than pure water. To investigate this I repeated the process but used 2.5mL of salt and sugar dissolved in two different beakers of 200mL of water. I placed these as well as a beaker of pure water and a beaker with 2.5ml citric acid solution in the freezer. I discovered that all the solutions had lower freezing points than water. My conclusion is anything dissolved in water changes its freezing point.

Summary Statement
My science project is to find out whether or not pH can change the freezing point of water.

Help Received
My parents helped me procure the necessary supplies for my project, reminded me to check the freezer, and also helped edit my board and report for grammar.