CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

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Project Number
S1713

Project Title
Would Sound Waves Promote the Freezing of Water?

Abstract

Objectives/Goals
The objective is to determine whether sound-wave-induced vibrations would promote the freezing rate of pure, distilled water using researches conducted on the Mpemba Effect as a reference.

Methods/Materials
Using 50ml of distilled water per experiment, we used 3000 hertz, sinusoid waves to induce vibration in water. Speaker was placed directly underneath the beaker of water. We decreased the volume of the speaker by one half for every 10 minutes. The surrounding temperature was controlled at -10 degrees Celsius. The freezing rate of the experimental group was observed every 10 minutes and compared to that of the control group, where water was not disturbed in any way.

Results
Both control group trial and the experimental group trials exhibited the same freezing rate. Decrease in temperature was most visible in the first ten minutes. As time progressed, the freezing rate slowed. Both graphs showed exponential decay. The data refuted our hypothesis that high frequency sound waves alone can increase the freezing rate of water.

Conclusions/Discussion
Our data refute the hypothesis rather disappointingly. There were no significant differences between the control and experimental groups. From the result, we can deductively reason that there is not a relationship between vibration and the freezing rate of water. We may conclude that the hydrogen bonds are not in fact responsible for the Mpemba Effect. Hence, it may or may not nullify the conjectures made by the Singaporean scientists that energy loss in water molecules is greater in heated water is due to water molecule expansion.

There is a possibility that our experiment did not support our hypothesis because the sound induced vibration is not strong enough to cause water molecules to lose energy. High frequency sound may carry more sound energy, but doesn#t necessarily mean more vibration to break up the water molecules. Our sources of error include using high frequency sound when there is a option of using high decibel sounds. Other sources of error such as opening the freezer, eyeballing the thermometer to get a rough measurement, all contributed to less accuracy. But fortunately enough, all the data seem pretty consistent.

Summary Statement
Using sound waves to promote the freezing rate of water as a phenomenon parallel to the Mpemba Effect.

Help Received
Used science lab at our high school under the supervision of the 10th grade chemistry teacher, Heng Yuan Shr.