CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

Priya Goel; Ankita Vinod

Project Number

J1710

Project Title

Effect of Impurities on the Surface Tension of Water

Abstract

Objectives/Goals

This project examined the effect of nine different impurities on the Surface Tension of water. Based on our research, the hypothesis was that the surface tension of water would decrease when impurities are added.

Methods/Materials

A balance was constructed with a needle hanging on one end of the beam and a pan to hold weights on the other end. A small piece of modeling clay was put on the beam to balance the needle and the empty pan. Other materials used included plastic cups, thread and rice grains. Distilled white vinegar, salt, sugar, milk, buttermilk, lemon juice, olive oil, food coloring, and honey were used as impurities. One cup was filled with bottled water and the other cups were filled with half water and half impurity. For salt and sugar, a saturated solution was formed. The cup of liquid was placed under the needle, so that the needle rested horizontally just on the surface of the water. The weights (rice grains) were added on the pan at the other end of the balance. Rice grains were calibrated by weighing fifty numbers of rice grains on a postal scale. The experiment was repeated 3 times for each solution for accuracy. Surface tension was calculated using the equation F=2sd, where F is the force in newtons N that was used to detach the needle from the liquid surface, the factor 2 was used because the needle has 2 surfaces, s is the surface tension/unit length in Newtons/meter (N/m), and d is the length of the needle in units of meters (m) Force was calculated using equation f=mg, where m is total mass of rice grains used to detach the needle from the surface of the liquid, and g is the gravity constant whose value is 9.8 * 10^-3 N/gm. Formula f=2sd was rearranged to solve for s (s= 2d/f). Measured length of the needle in meters was 0.05m. Formula was solved to get the surface tension of that impurity in N/m. The calculated value of surface tension was multiplied by 1000 to convert into mN/m.

Results

Results showed that water with salt impurity had the highest surface tension 82 mN/m followed by water with sugar impurity. Bottled water ranked third at 69 mN/m. Water with olive oil impurity had the lowest surface tension at 32 mN/m.

Conclusions/Discussion

Conclusion was that our hypothesis was correct to a certain extent. In most cases, surface tension of water decreased when impurities were added, except for salt and sugar.

Summary Statement

Measure the changes in Surface Tension of Water on adding Impurities.

Help Received

Teacher and Parents