CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

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Project Number

38546

Project Title

Exploring the Physics and Chemistry of Slime

Abstract

Objectives/Goals

My project is exploring the physics and chemistry of slime, a non-Newtonian fluid, the result of a chemical reaction between Polyvinyl alcohol (found in glue) and Sodium Tetraborate (Borax). The objective of this project is to scientifically characterize slime.I designed and performed 6 experiments: bounce, stretch, dry time, adhesive strength, water solubility and solvent agents. I created 4 slime recipes by varying the amount of Sodium Tetraborate and Polyvinyl alcohol. My 3 hypotheses are: (1) as Sodium Tetraborate increases, the polymers get tangled making the slime thick, (2) lemon juice would be the best solvent, (3) slime would stick best to wood.

Methods/Materials

Glue, Borax, homemade force meter, stopwatch, camera on tripod, ruler, lemon juice, vinegar, glycerin, stones, aluminium plates, acrylic discs, wood.

Used a camera to capture bounce and stretch distances. Observed different behaviors when samples are stretched in 1 second or 5 seconds. To measure dissolution, I tested lemon juice, vinegar and glycerin. Experimented with wood, plastic, metal, ceramic and stone, and measured the prying force.

Results

For dissolving agent, vinegar was the quickest while lemon juice slowest. Varying the amount of solvent did not speed up the process. The surprise result was vinegar beating out glycerin as the best solvent for slime. I had not predicted the 2 different behaviors for stretching which made sense since slime is a non-Newtonian fluid. For the drying test, I thought slime would dry uniformly. However, even when the outside is dry, the inside remains soft. I saw a thin layer of skin that seemed to protect the inside from air.

Conclusions/Discussion

I designed and performed 6 experiments to scientifically characterize slime. The results from these experiments gave information about the chemical and physical properties of this non-Newtonian fluid that resulted when Polyvinyl Alcohol (glue) reacted with Sodium Tetraborate (Borax). I tested 8 different samples with varying amount of Borax mixed in to see what influenced the physical and chemical properties of slime. The results indicated that as the long polymer chains of Polyvinyl Alcohol interacted with Borax, they get tangled and stick together, making the result a malleable solid.

Summary Statement

This project explores the scientific characteristics of slime: adhesive strength, stretch and bounce, dissolution, drying time and water solubility were measured.

Help Received

None