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**Lab: Designing Gadgets Using Oogoo**

**Introduction:**Silicone (siloxane) is a hydrophobic polymer contain a silicon atom bonding to oxygen atom creating the polymer backbone (see figure 1).Since silicon (Si) can have up to four bonds, the remaining three bonds can bind to various side groups creating a wide range of properties. Silicone can be manipulated to be hard, soft, sticky etc… depending on which molecule is attached to the -Si-O- backbone. Therefore, silicone are found in many products including cosmetics, hair conditioners, car wax, breast implants, adhesives.

Figure 1: Silicon-Oxygen backbone in siloxane structure. Functional groups are represented by the letter R.

We will be working with silicone that has two methyl groups named polydimethylsiloxane (PDMS) obtain from household caulk (figure 2). When inside the tube, dimethylsiloxane are monomers that haven’t cross-link. When exposed to moisture in the air dimethylsiloxane starts to cure (harden) and become PDMS. They cross-linked to create a long polymer chain (figure 2).

Figure 2: Polydimethylsiloxane (PDMS) from silicone caulk

PDMS repels water enabled them to be used as a sealant to prevent unwanted water. It is sticky and adheres to most materials inside the kitchen, bathroom, and plumbing. Some of these characteristics will be altered when creating oogoo, a new polymer that was introduced in the market.

**Objectives:**

* Study characteristics of oogoo polymer through quantitative data
* Design gadgets with oogoo polymer using its properties
* Create advertisement to sell your oogoo gadgets

**Materials:**silicone caulking syrofoam cup Oogoo sphere paper clip
corn flour popsicle sticks Silicone cylinder Set of metric weights

cylinder mold scale ruler 2 nylon spring clamps

ring stand

**Safety Precautions:**

1. Silicone caulking is sticky and will be hard to wash off skin
2. Do not ingest (eat) Oogoo

**Pre-lab:**

1. Describe the characteristic of silicone caulking and what do we use silicone caulking for?
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2. Based on the procedure in part 1, what do we use the cylinder mold for?
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**Procedure:**

***Part 1: Making Oogoo***

1. Weight about 3 grams of corn flour and place in your styrofoam cup
2. Come to the front to obtain about 3 gram of silicone caulking from your teacher
3. Use the popsicle stick to mix these two substances thoroughly for about 5 minutes to make Oogoo (mix until it is not sticky when touch with your hands)
4. Press the flexible Oogoo material into your cylinder mold (wait for about 10-15 minutes for the oogoo to harden) Leave this mold to dry.
5. Observe the characteristic of Oogoo and record them below on your data table

Table 1: Observations Data

|  |  |  |
| --- | --- | --- |
| 1 | Describe the appearance of corn flour | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 2 | Describe the appearance of silicone caulking | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 3 | Describe the appearance of Oogoo after corn flour and silicone are thoroughly mixed | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 4 | Describe how Oogoo feel when touching it with your hands | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 5 | Describe the strechiness of Oogoo before it hardens and after it hardens | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 6 | Describe what you see when dipping Oogoo in water | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

***Part 2: Collecting Quantitative Data***

1. Use a ruler to measure the diameter of your Oogoo sphere. Record
2. Weight the Oogoo sphere. Record
3. Drop the sphere from 1 foot above the ground. Record how far it bounced up after hitting the ground
4. Drop the sphere from 2 foot above the ground. Record how far it bounced up after hitting the ground
5. Drop the sphere from 3 foot above the ground. Record how far it bounced up after hitting the ground
6. Slowly open the cylinder mold that contain Oogoo you did from part 1
7. Use a rule to measure the length and diameter of the Oogoo. Record
8. Use a rule to measure the length and diameter of the silicone cylinder. Record
9. Attached the clamps on both side of the Oogoo cylinder
10. Hang one end of the cylinder onto the ring stand
11. Hang 100g weight on the other end of the cylinder. Measure and record the length of the cylinder
12. Hang 200g weight on the other end of the cylinder. Measure and record the length
13. Hang 500g weight on the end of the cylinder. Measure and record the length
14. Hang 700g on the end of the cylinder. Measure and record the length.
15. Repeat step #9-14 with the silicone cylinder

Table 2: Bounce Test Data

|  |  |  |
| --- | --- | --- |
|  | Sphere diameter (cm) | Sphere mass (g) |
| **Measurements** |  |  |
| **Bouncy Test** |
| **Drop Height** | **Bounce Height (cm)** |  |
| 1 ft |  |
| 2 ft |  |
| 3 ft |  |

Table 3: Tensile Stretch Test Data

|  |  |  |
| --- | --- | --- |
|  | **Length (cm)** | **Diameter (cm)** |
| **Oogoo cylinder** |  |  |
| **Silicone cylinder** |  |  |
| ***Stretching Test*** |
|  | **Length (cm) for Oogoo** | **Length (cm) for Silicone** |
| **100 g weight** |  |  |
| **200 g weight** |  |  |
| **500 g weight** |  |  |
| **700 g weight** |  |  |

**Analysis Questions:**

1. What are quantitative data?

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1. Describe the different shapes that you can make with Oogoo.

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1. Are there any product that can be created using Oogoo?

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**Project Creating Useful Products from Oogoo**

Take advantage of Oogoo’s physical property and design a product that people can use. Draw a prototype picture of your product below (must be in color).

Once prototype drawing is approved by your teacher, obtain and mix a small amount of Oogoo and create the product that you came up with.

Create an advertisement poster/flyer that promote and sell your product.