Crystallization of Sucrose with Different Humidity

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My project is about studying (measuring) how sugar glass forms crystals at it’s surface in moist conditions. I present data on the rate of formation of surface crystals on my sugar glass samples.

**Introduction** – What is a Glass

- Properties of glass
- Examples of glass (hard candy as an example of a glass)
- Concept of glass as an intermediate, Metastable “state” of matter.

**Crystallization**

**Hypothesis**

**Procedure** – How I Made Sugar Glass

- Crystals growing from Sugar Glass
- My Method of studying Crystal Growth

**Results (Data)** – Result1 and Result 2

**Conclusion** – Summary and Future Plans
What is a Glass?

• Structure of Glass

• Examples of Glass

Water glasses

lenses

Window pane

Optical fibers

bottle
Properties of Glasses

• Brittle
• Often clear or transparent
• Can be molded and shaped when soft (torch)

Candy is a Glass!

• Clear
• Brittle (when cracking with a hammer)
State of Matter

- Solid
- Liquid
- Gas
Crystallization

- Nucleation
- Crystal Growth
- Structure of Crystal

Structure of crystallization
Structure of Liquid …. Let’s compare!
Hypothesis

- What causes Crystallization?
- Which humidity is good for crystallization?

I thought…

Humidity causes Crystallization,

but I thought 100% crystallization would be a good for crystallization.
How to make sugar glass?

• Making glass
Recipe

• Recipe 1:
  • 1.5 cup “Domino” cane sugar (sucrose) (142gm)
  • 1/4 cup “Karo” corn syrup (82gm)
  • 1/4 cup water (60 gm)

• Recipe 2:
  • (1.5 cup cane sugar(sucrose) – 190 gm
  • 1/8 cup Karo corn syrup – 41 gm
  • 1/4 cup water – 60 gm)
Let’s put the glass on the slides!

My samples to study crystal growth
Originally no crystals – only glassy candy

Sugar glass made on 1/24/07
Make Humidity Chambers!

Humidity 50% chamber

Tight Lid

paper platform

slides with candy glass

Jars with saturated solutions

Mg(NO₃)₂ + water) for 50% RH

For 0% (dry) use desiccant CaSO₄

For 100% RH use wet paper towel
Top View of My 3 Chambers!

- Humidity 0% chamber
  - With desiccant, CaSO₄

- Humidity 50% chamber
  - With saturated Mg(NO₃)₂ solution

- Humidity 100% chamber
  - With soaked tissue in water
Nothing happens in 0% RH

Crystals grow in 50% RH

What happens in 100% RH
Start in 50% Rh on 1/04/07

7 days at 50% RH

1-11-07

1-19-07  15 days

1-25-07  21 days
# My First Sugar Glass Samples

## Sample 10407

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<tr>
<th>days</th>
<th>A</th>
<th>C</th>
<th>B</th>
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Crystal Widths (mm)

[Graph showing the growth of crystal widths over time for samples A, B, and C.]
My 2nd attempt

Sample 012407

Check these data points

Crystal width (mm)

# days

A

B
Summary

I have measured the rate at which sugar glass crystallizes with time. I have shown that the rate is very humidity dependent and extremely slow when dry. Using humidity controlled chamber I was able to measure the actual growth rate for the 50% humidity.

Future Plans

I would like to measure crystal growth rate at other compositions and even study the effect of temperature.