

Making Glass



Grade level

Grades 9-12

Materials (per team)

- Sugar
- Hot plate / kitchen stove / heat source
- Kitchen pot
- Cold cookie sheet, maybe iced down or kept in a cooler
- Something made of glass for comparison

Discussion

Glass was first made in the Middle East around 3000 BC. Glassmaking was common in many parts of the Roman Empire. During the Middle Ages, northern Europeans made stained-glass windows for decorative purposes. Glass appears to be and has many properties of a solid. However, it is really a very thick liquid, super-cooled below its freezing point before it becomes solid. Molten glass is cooled to this rigid state, but heat can reconvert it to a liquid form. Most glass is amorphous, meaning that its atoms are not arranged in a regular, repeating order. Window glass, in use since 100 AD, was originally made by casting or blowing. Today, nearly all window glass is made mechanically by drawing the molten glass from a furnace, rolling it continuously between double rollers, and floating the glass sheet on a bath of molten tin to create smooth and even surfaces.

Glass is often considered a subset of ceramics. Glass, like ceramics, is an inorganic, non-metallic material. It also uses some of the same raw materials as ceramics. Glass is different than ceramics in that it is amorphous, or has no long-range crystalline order. It is this feature that makes glass clear. The processing of glass products is also different than for ceramics. To produce a ceramic product, raw materials are combined, formed into shape using a variety of methods, and then heated at high temperatures in a kiln or furnace to produce a solid piece. To produce a glass product, raw materials are combined together and melted in a furnace. The molten glass is then formed into its desired shape and cooled quickly to solidify.

A glass ceramic is a glass in which fine, uniform crystals are grown by treatment with controlled heat, producing higher strength, increased chemical durability and greater electrical resistance than ordinary glass. Also, glass ceramics can be made with low thermal expansions, giving good resistance to thermal shock. Applications of glass are invaluable in engineering fields such as electronic superconductors, fiber optics, thermal insulation in aircraft and space shuttles, nuclear waste containment, and military radar communication systems.

Activity

1. Put a handful of sugar in a kitchen pot.
2. Melt the sugar on the hot plate. This may take a while, but the sugar will eventually melt. Take safety precautions to avoid burning hands, skin or other objects with the hot plate or the bottom of the pot. Use hot pads or a kitchen mitt and avoid direct contact with the heat source.
3. After the sugar has melted, it will look like a brown liquid, almost like maple syrup. When it looks like this, pour it onto the cold cookie sheet and watch it solidify into a clear transparent glass-like material.
4. Allow time for all of the glass to cool on the cookie sheet before touching or handling it.
5. Compare your homemade glass to other types of glass around you.



*This activity provided by
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Discussion

The process of making glass from sugar can be compared with the actual glass production process.

What differences are there between the glass that you made and the glass in your windows? Can you see through it as well? Why or why not? How does the increase and decrease in temperature affect the viscosity of the glass? Why does heat make this material more fluid?

