

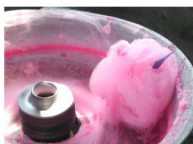
How are Glass Fibers Made?

The term “glass” includes many different materials, some with which you are familiar. *Soda-lime glass* is the most common type of glass and is used to make such things as window panes and glass jars. *Borosilicate glass* is another common type of glass that is more heat resistant than other forms of glass. Glass fibers, used to make fiber-glass, are made from glass that is similar to windows or drinking glasses.

To learn how glass fibers are made, we start with understanding that because glass can change from a solid to a liquid and then back to a solid is why it is such a unique material! This property allows gaffers (people who “blow” glass) or machines to work with and shape the glass into products such as vases or bottles.

To make glass fibers, glass is heated until molten (liquid), then forced through superfine holes. This creates glass filaments that are extremely thin. As the fibers are cooled, they transition back to a solid from a liquid.

You’ve eaten cotton candy haven’t you? That yummy treat is made by heating sugar (*a solid*) until it reaches a molten (*liquid*) state and squeezing it through small holes into a larger bowl that is spinning. The thin sugar fibers *solidify* almost immediately in the room temperature air and begin to collect on the outer edges of the bowl. When you eat the cotton candy, the heat from your tongue causes the fibers to dissolve into a *liquid* form again. A double glass transition: solid to liquid to solid to liquid!



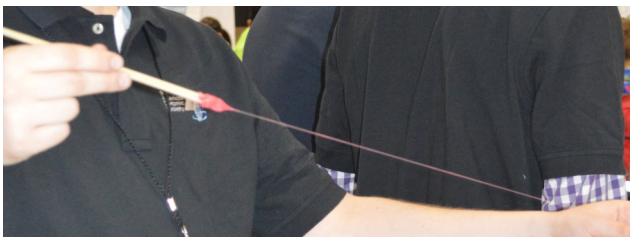
CERAMIC AND GLASS INDUSTRY FOUNDATION

Let's explore!

You can demonstrate a way that shows how glass fibers are made. Make sure you have a parent to help you with this.

Unwrap four of the Jolly Rancher® candies of the same color and put them into a Pyrex® or custard cup. Put the cup in the microwave and heat on high for 8 seconds. If the candy is not yet molten, repeat for up to 8 seconds. Remove from the microwave and stir with the bamboo rod. ***This will be a high temperature liquid (140-170° C) capable of burning. Please handle with appropriate insulation. Do not touch the cup bottom with your unprotected hand!***

You will form a candy glass ball on the end of the rod. Touch the candy ball to the side of the cup and start to pull the fiber. Notice that the fibers are fairly flexible when they are first pulled, but will harden the longer they are exposed to the air due to the small diameter of the fiber and the temperature difference between the air and the molten candy. Try this several times. How long of fiber were you able to pull?



Fiberglass-reinforced composites are used to make such things as swimming pools and spas, doors, surfboards, sporting equipment, boat hulls, and a wide array of exterior automobile parts. Optical glass fibers similar to the ones you pulled from the candy carry phone signals and form the backbone of today's Internet.

Learn more about ceramics, glass, and materials at ceramics.org/ceramicsarecool.

Demonstration originally developed by Missouri S&T, Materials Science & Engineering, <http://mse.mst.edu>