

Is There Shatter-Proof Glass Cookware?

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A glass is a completely chemical-free and eco-friendly material. It may be a good choice if you are considering stocking your kitchen with healthy cookware.

Glass baking dishes are considered safe for contact with food because glass is a nonporous and chemically inert material. Glass will not leach chemicals or metal traces into your meals and won't react even with highly acidic foods. A glass non-porous surface is easy to clean and sanitize after the use, as it doesn't catch food particles or absorb food odors and flavors. Glass bakeware features versatility, one-dish convenience, and attractiveness. Glass dishes are safe to use in the microwave and they are perfect for heating and storing leftovers.

The main disadvantages of glass cookware are its fairly low fracture toughness and an intolerance to sudden changes in temperature. A sudden variation of temperature (thermal shock) causes the glass to expand or contract, which may result in breaking.

What is Tempered or Toughened Glass?

Tempered glass is a type of safety glass which is especially strong and heat resistant. The tempering process makes the glass more than 5 times stronger than regular glass. The breakage pattern is also changed. When broken, tempered glass shatters into small, relatively harmless pieces without sharp edges, reducing the risk of injury.

Heat-Strengthened Glass

Heat-resistant glass is a type of glass with an increased ability to withstand thermal changes without shattering. This type of glass is suitable for kitchen applications where high heat and sudden cooling may cause a regular glass to shatter.

Some cookware pieces are safe for oven and cooktop use, while others can only be used in the oven. Heat-resistant glassware is usually made of borosilicate glass, tempered soda-lime glass, or glass-ceramic.

What is Borosilicate Glass?

Borosilicate glass is a type of heat resistant glass designed to withstand temperature extremes better than most other glass. Borosilicate glass is used for lab equipment, as well as for manufacturing high-quality kitchenware. Cookware made of borosilicate glass is thin, durable, safe, and convenient for cooking, baking, serving, and storing food.

While the two major brands of glass bakeware in the USA, Pyrex and Anchor Hocking, used to be made from borosilicate glass, that is no longer the case.

What is Glass Bakeware in the USA Made of?

To comply with new and tighter U.S. air pollution regulations after 1980 and to cut manufacturers' expenses for installing the new pollution control equipment, Anchor Hocking Company and World Kitchen, owner of the Pyrex brand, changed their manufacturing process of glass bakeware and switched from using annealed borosilicate to a less expensive tempered soda lime glass.

While European Pyrex glass bakeware is still made from borosilicate, the majority of U.S.-manufactured glass cookware today, regardless of manufacturer, is made of

tempered soda lime silica glass. Many consumers still associate Borosilicate with Pyrex, because they are unaware that the Pyrex glass bakeware has changed its formula over the last several decades.

Certain manufacturers use borosilicate glass that is put through an annealing process to make bakeware with tremendous stability against thermal shock. Borolux company (USA) claims that their patented borosilicate formula bakeware will never shatter due to thermal shock and offers a lifetime warranty on all of their products.

International Cookware from France offers a wide range of [bakeware dishes](#) made of borosilicate glass for superior heat resistance.

Simax® Glassware made in the Czech Republic has been known for over 200 years. The Simax [glassware](#) product line is made from 3.3 borosilicate glass, which features high resistance to thermal shock and superior chemical resistance.

Borosilicate Versus Soda Lime Silica Glass

According to manufacturers of soda lime glass, their glass has the superior mechanical strength and is much less likely to break when dropped or hit against something. However, it has much lower resistance to temperature extremes than borosilicate glass.

When broken, soda lime glass tends to crack into small pieces without sharp edges, resulting in fewer severe injuries from the broken glass.

Borosilicate glass is more resistant to breakage caused by rapid temperature changes, but it is considerably weaker against a mechanical force like dropping or knocking against a hard object.

When broken borosilicate glass tends to break into large pieces of very sharp glass, resulting in a higher likelihood of severe cuts from the broken glass.

Ceramic Glass Cookware

The glass – ceramic material has high strength, exceptional resistance to thermal shock, and it can withstand constant temperatures up to 1256 degrees F. The best known glass-ceramics material is Pyroceram, developed by Corning Glass in the 1950s. Pyroceram was first used in rocket nose cones because this material is able to withstand extreme temperature changes.

Pyroceram® is commonly used for kitchen applications where there is the probability of thermal shock. Corning Ware, a line of Pyroceram cookware, was introduced in 1958 and became very popular due its outstanding durability and versatility.

The original Pyroceram glass version of CorningWare was discontinued from production in the late 1990s, but it was re-introduced to the market in 2009 due to consumer demand. To ensure you are buying the original version, check the manufacturers' guidelines on the packaging. The original CorningWare dishes should be highly resistant to thermal shock and safe to use on the stovetop.

The original Pyroceram version of [CorningWare glass-ceramic cookware](#) can be used directly on the stovetop, in an oven or microwave, or under a broiler. These dishes can be taken straight from the freezer to the oven and from oven to freezer. They can go straight into the dishwasher or can be immersed while hot into the sudsy water without fear of cracking or breaking.

Why Does Glass Bakeware Shatter?

The most common cause of glass cookware breakage is mechanical impact such as being hit against something or dropped on a hard floor.

Thermal stress is another cause of breakage that develops from a sudden change in temperature. Glass is not a good thermal conductor and sudden shifts in temperature cause parts of a glass vessel to expand or contract more than other parts which may trigger breakage. "Thermal shock" occurs when glass goes from hot to cold or cold to hot too quickly, such as putting a hot dish directly on a cold surface. In some cases, the failure occurs slowly and the breakage doesn't happen right away after the vessel has been mishandled. But after sitting long enough the glass structure will fail suddenly. That is why sometimes a glass dish seems to break without any apparent reason.

The thermal breakage is sometimes caused by repeated heating and cooling cycles during normal kitchen use. Each cooking cycle adds a tiny bit of damage to the inside of the glass until the damage results in breakage.

The common cause of the soda lime cookware breakage is that they develop invisible cracks over time. Once a hot liquid finds its way into these invisible fractures, the soda lime glass will shatter causing a mess and a possible injury.

How to Avoid Glass Bakeware Shattering?

Over the past two decades, there has been an increase in the number of [accidents](#) involving Pyrex and Anchor Hocking glass bakeware. In some cases, consumers were hurt by sudden "explosion" of glass dishes. There's been a long debate in recent years, whether the manufacturers or users are to blame for accidents. Manufacturers state that failures occur because a small number of consumers don't use their products in accordance with the safety instructions on the packaging.

To reduce the risk of these incidents that may result in serious injury, consumers should follow safety warnings and read the instructions for use and care that the new glass bakeware comes with. Here are some basic tips on staying safe when using glass dishes for cooking and baking.

- Never place hot glassware straight onto a cool or wet surface, because the temperature contraction is more than the glass can handle. Also, don't place hot dish directly on the countertop, on the metal surface, or in the sink. To slow the cooling process, place it on a trivet, dry cloth, or a towel that will minimize the contact with a cold surface.
- Don't put glass bakeware directly on a burner or under a broiler. Don't take glass bakeware directly from the freezer to the oven, or vice versa.
- Retire from service glass bakeware that is chipped, cracked, or scratched, because such pieces are more likely to shatter.
- Don't pour hot liquids into empty, cold glass cookware pieces and also never add cold liquids into hot glass bakeware, because the sudden expansion or contraction may cause it to shatter.
- Always allow the oven to fully preheat before putting glassware inside.
- Cover the bottom of glass bakeware with liquid before cooking meat or vegetables.
- Allow bakeware to cool completely before washing, refrigerating or freezing.
- Never use glass bakeware at temperatures hotter than 350°F with the exception of ceramic glass.