

Ceramics

What are Ceramics?

Defined as any non-metallic, inorganic material that is formed by the action of heat. Clay is the longest known and most common of the ceramics.

- **Ceramics, Pottery**
General terminology mostly used for utensils made with clay.
- **Porcelain, stoneware and earthenware**
Categories of clays, explained below.
- **Glazes**
Paint-like liquids applied to the clay surfaces, hardened under heat to seal, smoothen and color. More below.
- **Firing**
Process of heating the clays at high temperatures to harden them. The process may be repeated, especially after glazes are applied.

Porcelain

Porcelain is a clay body; a combination of fine china clay, ballclay, feldspars and the like. When fired, it becomes very hard and strong and usually translucent. It is normally very white and has a very smooth surface when glazed. Unglazed porcelain is referred to as *bisque* or *biscuit*. Hard-paste porcelain is the standard, soft-paste porcelain is not as dense nor as white or translucent, and *bone china* uses bone ash to increase its translucence. Porcelain clays lack iron impurities and are ground to very fine particle sizes, which contributes to their higher density.

Porcelain is *not reactive*, so virtually any food can be cooked or stored in it. With ample liquid inside, it can usually be used on the stove, in conventional and microwave ovens, and even under the broiler. Freezer safe. Virtually non-stick, and dishwasher safe. Discoloration of bare (unglazed) spots can usually be cleaned with detergent and nylon scrubber.

Stoneware

Stonewares are high fired ceramics (usually containing fireclay, which adds to their strength) often made of clays that are not highly refined. They can be *brown, buff or white*, and commonly have some *specks* and some particulate material such as *sand* or *fine grog*. Stonewares are *vitreous or semi-vitreous*, not translucent.

They can be used in conventional and microwave ovens. Some stoneware can also be used over an open flame. Glazed stoneware is non-porous and can also be used to store foods. Some stoneware is dishwasher safe; we recommend washing by hand.

Earthenware

Earthenware is a clay fired at low temperatures where it does not become vitreous. Earthenware is *porous* and therefore not as strong as stoneware and porcelain. Glazes are usually very bright colored and if the glazes are properly chosen, earthenware can be quite strong and functional. Earthenware glazes will never be as hard as a porcelain or stoneware glaze surface. Therefore an earthenware glazed pot or plate will scratch or chip more easily than the harder surface of porcelain or stoneware.

Terracotta refers to a type of earthenware that contains red burning clay. *Majolica* is terracotta with an opaque white glaze, usually decorated with a colored over-glaze, and is stronger than terracotta.

Earthenware is usually best for conventional and microwave oven use, though some can also be used on top of the stove. If glazed, it becomes non-porous and can also be used to cook liquids and store foods. Washing by hand is generally recommended.

Glazes

Glazes are liquids applied to clays that, after hardening (firing), they seal, smoothen and color their surface.

Many compounds are used to make glazes, such as silicates, aluminates, oxides, tin, sodium, potassium, lead, iron, copper, and many more. The recipes made from such compounds usually take in consideration the utensil's intended use, matching thermal expansion properties between the clay and the glaze ingredients for longer useful life, and color.

Myriad factors, both natural and controllable ones, can alter the glaze's suitability and behavior.

Unglazed Spots

Unglazed spots are common to all ceramics, and are found in areas that do not affect the usability of the pottery. The *foot* of a pot or bowl, the area that rests on the unglazed or stilted surface or shelf of the kiln, is unglazed, because otherwise the glaze would bond to the kiln shelf during the firing process. The most expensive ceramics sit on the points of little stands in a kiln, so that more of the surface will take the glaze; the spots are evident if you look closely or run your hand along the bottom. An unglazed foot will absorb water from washing and can leave a water ring on furniture if not completely dry.

Unglazed spots or bubbles can sometimes appear in other areas of the pottery, caused by improper glazing, or by gas bubbles in the clay or glaze. Ceramics with such unglazed spots should be avoided for food contact, as the spots can harbor colonies of bacteria.

Crazing

Crazes are small cracks in the glazes of ceramics. They are caused by many factors, such as a different thermal expansion rate between the glaze and the clay, glaze ingredients, and the firing process.

Whenever possible, crazed (and cracked surface) ceramics should be generally avoided for food contact, as the cracks can harbor colonies of bacteria; using a bit of chlorine bleach or lemon to clean the cracks will help to rid bacteria.

Some high-quality ceramics have glazes that naturally craze. Check with the manufacturer's instructions on use and care requirements.

Specks

Usually found on stoneware, earthenware, and low-quality porcelains, dark specks in the glaze can be iron or other minerals that are inherent parts of the clay. This is normal and, unless pitted, the appearance of specks does not affect the usability or longevity of the pottery.

Health Concerns

There are no known adverse health effects from using unglazed clay in cooking, primarily because of the limited contact of food with the clay, and the fact that it's the clay that does most of the absorbing.

Glazed clay products produced and imported into the US and Canada are deemed safe through a series of tests that manufacturers and importers are required to submit to the government, proving the quantities of cadmium and lead to be within acceptable levels.

Be wary of ceramic cooking utensils you might bring in from your travels to non-regulated countries; better to use them as flower pots instead.


Lead in Ceramics

Lead can be found all around us in dishes, fine crystal, painted walls and woodwork, toys, furniture, antique varnishes, solder, dust and soil. The effects of lead poisoning are cumulative throughout our lifetime, therefore it is important to limit our exposure to it.

In the ceramics industry, some lead glazes are still used to color or decorate and to smooth the surface of ceramic products. As long as the clay and glazes are compatible, and these glazes are properly fired (at a high enough temperature and for an appropriate amount of time), the lead is not likely to leach through the surface.

With constant use and scrubbing, ceramic products can wear down over time, and may allow lead to leach through. Hot and highly acidic foods, and prolonged time of contact, will increase lead leaching from such damaged surfaces. Antique, highly decorated ceramics are the most likely to leach lead.

You might be able to visually detect lead leaching if ceramic items show a dusty or chalky gray residue on the glaze after they are washed. When testing for lead content, be sure to test the surface that comes in contact with the food.

 - This triangle is required to be displayed by California law, on or next to pottery that has been tested and found to leach lead into food above California's Proposition 65 warning levels. The pottery may have been tested to be within the safe guidelines established by the Food & Drug Administration, however the standards established by Proposition 65 are significantly stricter than those of the FDA. Unfortunately, if the importer or manufacturer of the pottery has less than 10 employees, they are exempt from displaying the triangle warning, so be wary of where you shop. When you see the triangle displayed, it is to help you make an informed choice.

Other Ceramics

Ceramics that don't use clay include borides, carbides, nitrides, silicides, and oxides (alumina and zirconia). Most ceramic knives, for example, are made of zirconium dioxide, a type of zirconia.

These types of ceramics have very different properties and uses from clay ceramics, and each has its own specific use and care requirements.
