

Vitrification

Vitrification is a process during firing where we physically change the clay. This melts the glass formers in the clay to make it impervious to water. Vitrified clays are dense and strong, and bacteria cannot grow in them. Non-vitrified clays are porous, weak. And allow bacteria to grow in them.

Most clay manufactures list the cones your clay should be fired to and test absorption rates. This information is either printed on the box of clay, on the manufacturers website or you can contact them directly to obtain it.

Testing for Vitrification

1. Simple Absorption Test. Fill a piece with room temperature water and let it sit on a paper towel for at least 1 hour. If the paper towel is dry, then your clay is vitrified. If the paper towel is damp, then your clay is still absorbent and not vitrified
2. More Accurate Absorption Test. Weigh your fired unglazed clay, then boil it for twenty minutes. Weigh it again and see what the increase in weight is.

Formula for this is: $\frac{\text{The difference in the weight}}{\text{the original weight}}$ = the absorption rate

Here is an example: If your pot weighed 1 pound before testing and 1.10 pounds after boiling, your absorption rate would be 10%. This means that your clay is either underfired or is highly absorbent and not vitrified.

About Clays and Vitrification

Porcelains will often have nearly zero absorption when fired to the appropriate cone. Stoneware clays will be from 5% absorption or less with 3% or less being ideal for food safe wares.

Stoneware clays really can't be fired to zero porosity due to substances like organic compounds, releasing as gasses late in the firing. If you try to fire hotter or over fire the clay to achieve zero porosity, the gasses have no way to get out which will lead to bloating. They will also be very brittle and break easily with use.

Earthenware clay does not contain enough glass formers to become vitrified. And this is a reason why it is still porous when it has been fired to maturity. Low fire clay is food safe when coated with a food-safe glaze. When coated with a food-safe glaze and fired to full maturity, unglazed clay surfaces may be regarded as food safe since the clay particles vitrify sufficiently. Clay and glaze are sufficiently melted together to form a waterproof surface. The result is a glaze coating where foods cannot penetrate the surface.