

# Firing Tips



## FIRING CERAMIC BODIES

Most bodies and glazes contain clay. These fine clay particles give the body and glaze many desired properties and bonds other materials together.

### **When the body is fired:**

- clay and other minerals in the body start to change
- clay/minerals break down and react with other materials to produce gases
- at 900 F (red heat), tightly held water molecules begin to break free and leave
- gases such as sulfur oxides and some fluorine may be released
- as the temperature increases, clay and other minerals continue to change and react with each other to form new compounds that will be part of the final product
- some products form glass which will bond everything together

### **Gases**

The gases which form need to be removed from the body. For example, carbon is in the clay and organics are added to the body, glaze or decoration to improve strength during handling or application. These must be removed during firing to avoid defects.

### **Firing Conditions**

Firing conditions can also determine

many properties of the fired product. Firing too fast at lower temperatures may not allow sufficient time for materials to react and gases to leave the body or glaze.

Firing too fast can result in:

- weaker bodies
- pinholing
- bubbling of the glaze
- color changes in the body
- color changes in the decoration
- mildewing of porcelain
- crazing or peeling of glazes if body is not properly mature

### **TYPES OF BODIES**

#### **Earthenware**

- typically fired from Cone 07 – 03
- made with talc, less expensive clays
- clays contain many impurities, need fired longer at lower temperatures
- low shrinkage
- porous after firing
- usually tan or red in color
- frequently glazed or stained
- sometimes used as fired

Often, problems arise because bodies are underfired. The piece may look okay, but is porous and weak. Also, underfired bodies may not match the expansion of the glaze used in a later firing. This can result

in glaze fit problems or cracking of the body in use.

The high iron and carbon content of these clays requires plenty of air during firing to maintain good color and to burn out all of the carbon. If this is not done, many problems can occur when the product is glazed and refired.

### **Stoneware**

- typically fired between Cone 6 – 10
- large number of compositions
- contain clays and other minerals with many impurities, including sand, feldspar and grog
- additives are used to provide plasticity, workability, strength, color and to reduce shrinkage
- colors depend on raw materials

Because of the additives and impurities, care needs to be given to how stoneware is fired and to proper ventilation of the kiln early in the firing to burn out organics.

Stoneware is vitreous and contains a high percentage of glass in the fired product. For color variations, mature the ware under reducing conditions.

### **Porcelain**

- typically fired from Cone 3 – 10
- compositions vary, but contain high quality materials
- colorants may be added
- bodies are hard, white, translucent
- very high glass content
- narrow firing range - need to be fired close to slump or sag point for best fired properties

Because color is very important, these bodies need to be fired with plenty of air below red heat to be sure all the carbon is removed. Shrinkage is high and special care must be given to supporting porcelain during firing or it will warp and distort.

### **CRITICAL FIRING PERIODS**

For all clay containing bodies and for most glazes and decorations:

- be sure ware is dry before firing
- fire slowly below red heat (1100 F) where many changes occur in the clay and other materials
- provide plenty of air below red heat for oxidation and to burn out organics and carbon
- do not to force cool the kiln while it shows red heat

### **Want to learn more?**

Read more about successfully firing ceramic bodies in the Orton Firing Line and Technical Tips publications. Members of the Orton Center For Firing receive these publications at no charge. Single copies are available to non-members at a per issue rate.

*For information on Orton products, see your Orton dealer or distributor.*

*For information on the Center For Firing or publications, contact Orton Center For Firing, PO Box 2760, Westerville OH 43086, 614-895-2663*