

## What are Crystal Glazes

Crystalline glazes are speciality glazes that show visible and distinct crystal growth in the matrix of the fired glaze. Although most crystals are not this large, some can grow up to four or five inches across within the glaze matrix.

### Crystals in Glazes



*Image Courtesy of Mara Cammi Orsi*

Invisible crystals inhabit many if not most glazes. Many matte glaze textures and opaque glazes are the result of multitudes of micro-crystals, or crystals that are so small that they are invisible to the naked eye. The macro-crystalline glazes, or more commonly known simply as crystalline glazes, have crystals that grow large enough to see.

The glaze on a fired pot is generally an amorphous super-cooled liquid. As the glaze is melted and cooled in the kiln, glass molecules bond together in random strings. Crystals occur if the glaze is fluid enough to allow molecules to move more and hot enough long enough to allow the glaze molecules to arrange themselves in structured strings, or crystals.

### How Visible Crystals Form

The macro-crystals found in crystalline glazes form around an nucleus of a tiny titanium oxide or zinc oxide crystal. In the right circumstances, zinc and silica oxide molecules will begin attaching themselves to the nucleus crystal. These molecular bonds are in very specific arrangements, which we see as crystals.

For this to happen, there must be an extended time at higher temperatures to allow time for crystal growth, and the glaze must have the right type of chemical composition. These are the first two of three factors that potters deal with when working with crystalline glazes.

## What are Crystal Glazes

In general, crystalline glazes are also high-fire glazes and require relatively high percentages of zinc, titanium, or lithium. Lithium is able to encourage crystal growth even in lower temperature glazes.

Crystalline glazes are lower than normal in their alumina content. In addition, the amount for free silica in both the glaze and the clay body must be kept at a minimum. Otherwise, cristobalite may form, making the pot much more brittle and susceptible to thermal shock.

Because of these requirements, crystalline glazes tend to be quite runny. Pots should be fired on a bisque tile and stilted to catch all drips. The pot's bottom may need to be ground and polished after removal from the kiln.

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### **Glaze and Crystal Coloration**

Because of the crystal's molecular structure, only certain colourants can migrate into and colour the crystal. These are cobalt, nickel, copper, iron, and manganese. However, due to molecular characteristics these colourants do not all act the same way.

Cobalt is the strongest; it will override the attraction of the other colourants and move into the crystal structure alone. For example, if cobalt and manganese are both present, the cobalt will migrate into the crystals making them blue, and the manganese will remain in the glaze matrix, making it yellow. If cobalt is not present, nickel takes next precedence in migrating into the crystal, then manganese, then copper. Copper, if by itself, will colour glaze and crystal fairly evenly.