

Crystalline Pottery

Condensed from an article by Al McCanless

Crystalline is a special effects glaze found in pottery which contains large (or macro crystals) of zinc orthosilicate. The naturally occurring mineral form of zinc silicate is called Willemite. Many pottery glazes produce crystals but most of them are too small to display their structure. Iron, barium, and titanium all produce crystals in glazes, but only zinc makes the spectacular crystals of up to three inches or more in diameter.

Most people who observe crystalline for the first time are amazed and usually ask "What is it and how did it get on the pot". Some think it's painted or explodes on there or the crystals are applied to the pot in some mysterious manner.

How is it really done? Well, here's the secret. The glaze contains three basic ingredients necessary for crystal growth: zinc oxide, silica (or ground quartz) and a frit which is fused glass that is ground to a fine powder. These three powdered ingredients are mixed with water to form a thick glaze which is then applied to the pot. The pot itself is turned in porcelain clay for best results. Stoneware clay can also be used. Various metallic oxides such as copper or cobalt oxide, iron, manganese or nickel oxide are added alone or in combination to give colors ranging from white (absence of color) to blue, green, gold, purple, orange, etc.

Crystalline glazes are very runny, that is when the pot reaches peak temperature the glaze is actually slowly flowing off the pot. Each pot must rest in a small dish mounted on a pedestal. The dish collects the glaze so it won't run off onto the kiln shelf and ruin it. The pedestal keeps the bottom of the pot from sticking to the dish. The pedestal is carefully removed after the pot cools to room temperature with a mallet and chisel and the bottom of the pot is ground smooth on a silicon carbide grinding wheel.

When the pots in the kiln reach about 2350 degrees Fahrenheit (1304 degrees Celsius) the kiln is turned off and the temperature allowed to drop about 300 degrees Fahrenheit. At this point the glaze is no longer flowing off the pot but is still molten. This is the point where the crystals form. Since the glaze is saturated with zinc silicate, which has formed when the zinc oxide and silica are dissolved in the molten glaze, the crystals form as the pot is held at this cooler temperature. This is roughly the same thing that would happen if you dissolved a large quantity of salt in boiling water and as it cools, sodium chloride crystals would form. The kiln must be maintained at this lower temperature for several hours to allow the crystals to grow. The longer you hold it there the larger they get provided enough zinc silicate remains in the glaze to form the crystals. The kiln is shut off after the crystals have grown to the desired size.

Historically, crystalline has probably been around a long time. Some say the Chinese produced crystalline hundreds of years ago, but I have never seen an example in a museum or pictured in any books dealing with Chinese pottery. I imagine crystals did occur by accident throughout history on pottery and the Chinese with their rich and ancient pottery tradition more than likely encountered them.

It was actually around 1890 in France at the Sevres porcelain factory that a chemist developed the macro-crystalline process that we know today. Some very spectacular and beautiful crystalline pottery was produced by the art potteries of the late 1800's and early 1900's such as Rookwood Pottery. In the early 1900's in the North Carolina Mountains, Pisgah Forest Pottery produced some crystalline pottery achieving some lovely results in a wood fired kiln. These are very rare and expensive as is all of the early crystalline pottery. More

recently, extensive work was done by the late Dr. Herbert Sanders of California State University, and much information appears in his book published in 1974 entitled "Glazes for Special Effects".