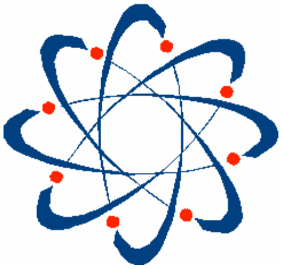

GLAZE TALK

By Karen Latorre

This is the second of a series of columns focused on glazes. The first column covered the basics of a glaze, the three oxides types that make up a glaze and their function in the glaze.

Glass Former	**+**	**Flux**	**+**	**Stabilizer**	**=**	**Glaze**
(RO2)		**(R2O/RO)**		**(R2O3)**		
(Acid)		**(Base)**		**(Amphoteric)**		

In this column I will address the ratio of the three parts of a glaze and indicate the results you can expect when the ratio is adjusted.

A PERFECTLY BALANCED GLAZE

Glossy transparent glazes are the result of the three parts being in perfect balance. There is enough of each of to completely mix and form the glass structure. There is no excess of any oxides left "hanging around" in the glass structure.

As we increase or decrease any one of the three parts, the appearance of the glaze changes. When there is more of an oxide than is necessary to form the glass structure, the excess oxide is left suspended in the structure. This causes the structure to be less transparent, and the excess oxides may also form crystals which pull the glaze away from having a glossy surface.

EXCESS SILICA

Glazes with an excess of silica are called silica matts. The surfaces can be very harsh and dry depending on the amount of silica in excess, and could be roughly textured like sandpaper. As the silica amount increases past the balanced amount, crazing begins to appear and gets worse until the glaze becomes so unbalanced that it no longer fully melts.

EXCESS FLUX

If the excess oxide is one of the fluxes, the result may be a glaze with a patchy surface texture part of the surface being glossy, and part of the surface would be matt opague, where the excess flux has formed crystals or the glaze could be so fluid that it runs off the pot.

There are two groups of fluxes, the alkalis and the alkaline earths. The fluxes that fall into the Alkali category (R2O) are:

Potassium oxide (K2O)
Sodium oxide (Na2O)
Lithium oxide (Li2O)

These are the more powerful fluxes used in pottery glazes. The result of having an excess of any one of these three fluxes is a glaze that will become very runny, or fluid. The surface of the glaze would be very bright and shiny, but will also tend to craze (develop cracks in the structure of the glaze).

The alkaline earths include those flux oxides with the RO formula:

Calcium oxide (CaO)
Magnesium oxide (MgO)
Barium oxide (BaO)
Zinc Oxide (ZnO)
Strontium Oxide (SrO)

An excess of these in the glaze will produce a surface that is blotchy, with areas that are glossy and clear, and others that are matt and opague. This is where we find the glaze families of calcium matts, magnesium matts, and barium matts. Magnesium matts tend to form very small visible crystals. An excess of zinc oxide in the mix tends to form larger crystals, and along with the absence of alumina, forms the basis of macro crystalline glazes. Strontium is a more expensive flux which behaves very much like calcium and zinc. Due to it's cost, and the availability of the other fluxes, strontium has not been commonly used, although in excess it would also form a microcrystalline matt surface.

Lead Oxide (PbO)

Lead oxide is an important flux for use at low and medium temperatures. Lead is highly poisonous and is prohibited in most studios. It is currently only available in a frit and is used for earthenware or raku glazes. Lead oxide is not over fluid. Lead oxide would react in the same way as the alkaline earths in an excess flux glaze.

EXCESS ALUMINA

Glazes with an excess of alumina tend to be very stiff glazes with a tendency to form pinholes (since the glaze is too stiff to flow and cover the hole). As the amount of excess alumina is increased, the glaze surface moves from transparent glossy, through translucent satin, to matt and opague, and depending on the amount of alumina in excess the surface can be a "dry" matt.

FIRING TEMPERATURE

The two main parts of the glass structure are the glass former and the stabilizer. The flux is there to lower the melting temperature of the glass to within a range achievable by our kilns. For a given amount of stabilizer + silica, by increasing the amount of flux in the mixture, you decrease the firing temperature required to obtain a good melt and form the glass structure. There is a ratio of stabilizer to silica which is ideal for all firing temperatures. Along with this ratio, for a given cone level, there is an appropriate amount of flux required to achieve the melt. These ratios and the concept of a unity formula will be discussed in the next Glaze Talk column.