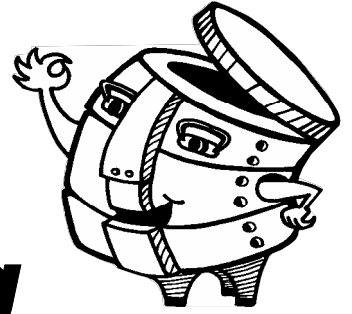


Tech Talk



Success With Glazing

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We all know by now that ceramics is a wonderfully creative craft that appeals to all audiences. We also know that there is a bit of technical knowledge required to successfully complete ceramic projects or manage a studio. The science behind ceramics need not be so daunting or intimidating. We hope the following article addresses some of the important technical aspects associated with the physical characteristics of glazes and what they mean to you.

FLOCCULATION, VISCOSITY, THIXOTROPY All these terms are rarely in the vocabulary of a contemporary studio owner; yet, you deal with them on a daily basis even if you cannot pronounce them. Having a basic understanding of these concepts and tools can greatly improve one's chances of success in the glazing process. Let's start with a basic definition of each term and discuss how it all works together:

Flocculation: to combine in a loose aggregated mass. Glazes "floc" to form a gelatinous mass.

Viscosity: refers to the fluidity of the glaze and how it responds to force.

Thixotropy: is when a glaze liquefies when stirred or shaken and then returns to its original state after standing.

Why are glazes gelatinous? Glazes are complex formulations composed of various suspending agents, colorants, and stabilizers as well as finely ground compounds such as frit (ground glass). Most glazes are thixotropic in nature. *What does that mean to me?* That the glazes tend to leave their gel-like state and become more fluid when

disturbed, as by shaking or stirring. A vigorous shake or stir will cause a thinning effect allowing the material to be evenly applied to the ware.

So what causes this affect? Suspending agents, such as clay or claylike materials, are added to the glaze formulation to produce this desirable effect. As these materials have a natural affinity for each other, they will combine when left undisturbed such as sitting on the shelf in the studio. This phenomenon is called flocculation.

This gel formation is a desirable feature in glaze

since it prevents the glaze from settling out and forming a solid mass or pancake, which is difficult to re-suspend.

But why is this important to me and why should I be concerned?

The tendency to flocculate affects the viscosity of the glaze.

Viscosity refers to the thickness of the glaze, which will determine the amount of glaze that is actually applied to the ware. Too much glaze can cause imperfections in the surface, crawling or discoloring the underlying glaze. Too thin of

glaze will create a "glaze starved" situation.

Thoroughly mixing the glaze will reduce the viscosity to the "working viscosity". Heed the manufacturer's recommendations to thoroughly stir or agitate the glaze prior to use. Not only does it ensure that the suspension is homogeneous (uniform throughout), but it will return the glaze to the ideal "working viscosity". The ideal "working viscosity" is more related to personal preference. What is an appropriate viscosity for one person's technique may not be ideal for another's. It is for this reason that we develop methods to accurately measure viscosity.

If viscosity is so important, how do I manage it?

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Having a basic understanding of these concepts and tools can greatly improve one's chances of success in the glazing process.

First, start by knowing the viscosity of your glaze. There are many products on the market, which can be used to measure viscosity. A very convenient method for viscosity measurement is the use of a viscosity cup. They come in many shapes and sizes and are simply a reservoir with a hole in the bottom of it. These devices report the viscosity in the number of seconds in which the medium empties (glaze stream breaks). An industry standard is a Zahn cup. It is graded in several sizes dependent upon viscosity of the fluid being measured. Higher caliber Zahn cups are generally used for thicker (more viscous) liquids. A #3 Zahn cup is commonly used in industry to measure glaze viscosity. The lower the reported time to drain indicates lower viscosity glaze. High counts correlate to high viscosity. For example, a typical leaded dipping glaze formulation will measure about seven seconds in a #3 Zahn viscosity cup. Measuring using a similar product such as Dupont M50 viscosity cup will yield 17seconds. A simple comparison of the seconds to drain would suggest that the later glaze was higher in viscosity than the former. But it was the same glaze and has the same viscosity. The difference in reservoir size and orifice diameter contributes to this discrepancy. It is for this reason that one should only compare viscosity determinations from the same model of cup. With experience one can determine their ideal "working viscosity" for the glaze and his/her own technique.

An alternative method adopted by our industry has been the use of hydrometers to determine viscosity. A typical hydrometer is a sealed glass tube of fixed weight, which is suspended or "floated" in the glaze. Hydrometers were not actually designed to measure viscosity but specific gravity of a solution but can prove useful in revealing the relative fluid condition of the glaze. The deeper the penetration of the hydrometer, the lower the viscosity of the glaze. As with viscosity cups, there are also many types of hydrometers (Brix, Specific Gravity, % Alcohol, etc). It is for this reason that only the same type/scale of hydrometer be used to compare glaze fluidity.

Regardless of your tool of choice, we recommend that you use the manufacturers' recommended readings as a guideline and establish your own preferred settings that you will use going forward. Understanding the terms we have used in this article not only helps you understand some of the glaze chemistry but will also help you communicate with your manufacturer in the event of a problem.