

Accurately Measuring and Reproducing Glaze Density

Depending on the nature of your studio output, it may be very important to reproduce glaze effects with a high degree of accuracy. One of the most important ways to do that is by accurately reproducing the specific gravity of the glaze with each new batch. Scientists often measure specific gravity with a hydrometer, and while that works fine in solutions and in very thin suspensions like terra sigillata, accuracy decreases with heavier glaze slurries. For that, the most accurate means are either by rheology or by comparative weight of a known volume. In physics, rheology refers to the flowing qualities of materials. That sounds pretty high-tech, but in this case it really isn't, and if you are so inclined, research viscosity cups or flow cups that allow you to measure the density of glazes by the elapsed time it takes for a measured amount to drain from these specialized funnel-like cups.

My preference is to measure density by weight as compared to water, because that's what specific gravity is – a measure of the density of a liquid in comparison to water. For this you need a sturdy cup of twelve to sixteen ounces capacity with an absolutely level rim and no dips, high spots, or pour spouts in the rim, and with a diameter less than its height. An aluminum or stainless steel tumbler works well and will last forever, but any sturdy metal or plastic container that meets these requirements will work, or even a glass or ceramic container as long as it has a sharp inside edge at the rim. The size doesn't really matter as long as it is at least twelve ounces, because a smaller cup or a larger-diameter rim proportionally increase the likelihood of error.

Place the cup on the gram scale and zero the weight with the tare beam (see instructions on using a triple-beam balance in *Clay: A Studio Handbook*), or if your scale does not have a tare function, weigh the cup and record the weight on the outside of the cup with a permanent marker and also in your notebook. Leave the cup on the scale platform and carefully fill it with water from a pitcher or measuring cup until the top of the meniscus is right at the rim. The meniscus is the curve in the surface of a fluid right where it meets the wall of its container, and it is important to make sure that the meniscus comes right up to the exact rim. That's why having a dedicated weighing container with a fairly sharp edge at the rim is critical. Weigh the container full of water and record the weight on the outside of the container with permanent marker (and in your notebook), or if you do not have the tare function subtract the weight of the container and then record the weight of the water.

To determine the specific gravity of a glaze, place the clean, dry container on the gram scale and zero the tare beam and then carefully fill the container with glaze (make sure that you just blended the glaze to bring all materials into suspension) using a measuring cup or pitcher, and make sure the meniscus comes right to the rim of the container just as you did with the water. It is essential that you are absolutely consistent in this with every glaze. Weigh the container and record the weight in your notebook (subtracting the weight of the container if you do not have the tare function). To get the specific gravity, divide the weight of the glaze by the weight of the water.

It's instructive to know the specific gravity of each of your glazes, but the measurement used to reproduce the same fired glaze in subsequent batches is the ideal weight of the liquid glaze in the weighing cup. It often takes many repeated test firings to get the visual results you seek, or you may get lucky with the first firing. When you are happy with the fired results, use the weighing cup and accurately weigh the glaze and record the weight and specific gravity digitally or the old fashioned way in your recipe file. This process must be repeated with every glaze, because there's no assurance that the ideal specific gravity of one glaze will work for another.

When mixing a new batch, thin the mixed, blended glaze with water until it is a little thicker than desired, and then start checking with the weighing cup, pouring the glaze back into the bucket, thinning with a little water and blending, checking with the weighing cup again, repeating this until you get it right on. Make sure that the cup is dry and free of glaze on the outside each time you place it on the weighing platform and refill it. Once you're experienced at this it goes very fast. Keep in mind that any freshly-mixed glaze will thicken up a bit overnight as the particles continue to absorb water, so for the most accurate results, let the glaze sit overnight before checking and weight and adjusting the water content.