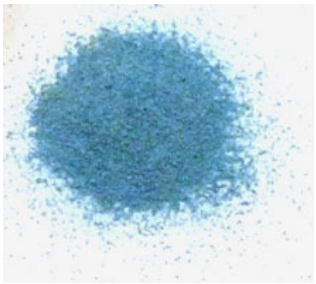
Enamel Properties & Safety

by Margaret Zinser & JC Herrell

Properties

Enamels are made of finely ground glass that's been modified with metals that give the enamel its color. The resulting material is highly saturated, making enamel a bit more brittle than glass alone. It's this property that makes enamel work best as a coating on metals or glass.

Thompson Enamels is the only producer of jewelry enamels in the western hemisphere, and has, in some incarnation, been in business for more than 100 years. The "About Us" section of their website (www.thompsonenamel.com) tells a great story of their history, and it's well worth checking out.



Enamels have higher working temperature than glass rod, requiring 1500° F to fuse. Making matters a little more challenging, they are also very sensitive to being heated quickly. Enamel needs time to process heat on the way up to working temperature or it will very easily boil. To avoid boiling the enamels bring them to temperature slowly, introducing an enameled bead into the back of the flame and gradually working forward until the enamel is fused.

As we take precautions with enamel to avoid boiling, we also need to be aware of flame chemistry. Certain enamel colors- especially the pinks, purples, and white- are more sensitive to reduction, which leaves scummy yellowish/brownish residue on the surface of the bead. An oxidizing flame, to the other end, can cause boiling. A neutral flame is your best bet.

Enamels also have a sticky quality. This poses interesting situations both in the kiln and in the flame. It is important keep a freshly made bead clear of any other beads in the kiln as an enameled bead can easily "kiss" another bead and tack fuse to it. When applying layers of enamel the sticky quality will help create thicker, more solid coats because cold enamel adheres better to warm fused enamel than to warm glass.

Layers of enamel on a bead form a stiffer skin that, combined with a soft bead core, can make shaping difficult. When repeatedly heating a bead to roll in enamel, the core of a bead can get too soft, and can cause a bead to lose shape. MZ prefers to keep her enameled beads on the cooler side during decoration, only heating so as not to crack the bead. She regularly marvers a bead to reinforce its shape, and to remove heat from the bead, keeping the core firm. Then, when she heats the bead in the flame, the heat stays in the outside layers of the bead, making shaping a bit easier.

JC likes to keep her graphite shaping tools warm with a ceramic pre-heater to shape enameled beads. This helps to keep the enamels warmer and workable longer, reducing the likelihood of chill marks. Chill marks are tricky to remove from enamel because it is both sticky and very sensitive to quick heating.

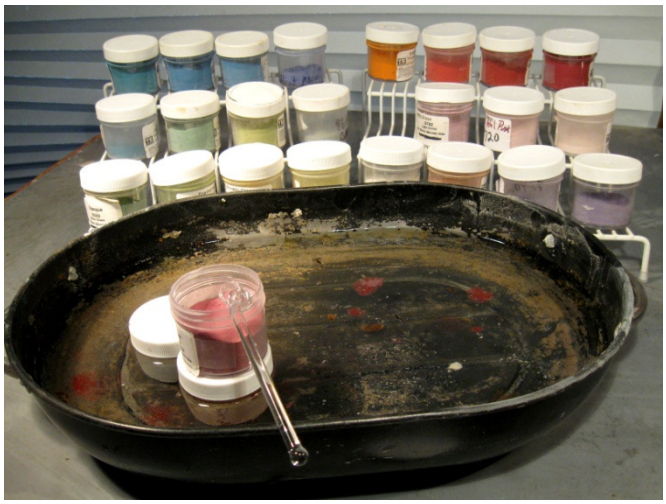
Enamel's stickiness and viscosity mean that it flows differently than most glass. When stretched, enamel will pull apart from itself, leaving voids of the base color peeking through. As a result, if you want to maintain complete coverage of enamel on a bead, avoid dramatically changing the shape of the bead after applying enamel. On the flip side, however, pulling or shaping an enameled bead can create more organic, textured, effects.

Safety:

Safety is an extremely important concern when using enamels. As powder/dust, they become airborne very easily. You breathe air, and enamel in the air will go into your lungs. Last time we checked, silicosis is very bad. Be sure to use proper ventilation. JC prefers a ventilation system that pulls away from the torch and to the back of the bench over a system that pulls air up, such as into a hood, where air and dust must pass by your face to be evacuated. A powder box is also an excellent ventilation solution when using enamels (and powders).

A respirator, rated for glass particulates (NIOSH rating of N100, P100 or greater) is also a must. Your respirator, regardless of its style, must fit your face, properly sealing around your nose and mouth. Beards and respirators don't work well together. If you have a beard, consider a soul patch for your enamel adventure.

Likewise, enamels are made of glass and metal, neither of which are good to consume. They don't taste good, and they aren't good for us. Don't eat or drink in the studio while you're working with enamels.



Sifting enamel produces a lot of waste on the table, in addition to a lot of airborne dust and yuckiness. To keep the waste that falls past the bead from becoming airborne, sift over a wet surface. JC uses a roasting pan filled with water but even wet paper towels will prevent the wasted enamel from becoming airborne. All clean-up should be done with a wet rag. Sweeping or vacuuming dry enamels will increase the likelihood of eating or breathing them.

Be aware of your sifter. Plastic sifters melt easily when they touch or get too close to a hot bead. Have a few plastic sifters on hand for finishing a bead that has just melted a sifter. Or use a metal JC Sifter, designed by Arrow Springs, which can be used without fear of melting. The sifters are available in 3/8 inch, 1/2 inch and 1 inch sizes (size matters) appropriate for any size bead you prefer to make. The JC Sifters can be purchased at www.jcherrell.com and ArrowSprings.com.

Thompson enamel color palette for 104 COE glass

Opaque

9010 white
9105 yellow beige
9180 dark coffee
9250 goldenrod
9260 praseodymium yellow
9320 gray green
9330 apple green
9350 moss green
9520 gray blue green
9530 blue green
9550 aqua marine
9605 baby blue
9620 medium blue
9650 oxford blue
9660 brilliant blue
9710 light petal pink
9720 dark petal pink
9725 flesh
9730 pink flesh
9740 new purple
9760 light orchid
9780 dark orchid
9790 dark purple
9810 peach
9835 orange red
9840 bright red
9850 dark red
9920 light oxford grey
9940 dark oxford grey
9990 midnight black

Transparent

9400 clear
9434 gem green
9436 glass green
9443 beryl green
9443 turquoise
9452 aqua blue
9453 water blue
9463 bonnet blue
9466 nitric blue
9480 pink red

A note about transparent enamels

Transparent enamels, particularly when used in several coats, can often appear foggy rather than crisply transparent like glass rod. This can be a great effect for water or other organic scenes! However, clear enamel will not encase as glass will. Rather as more and more layers of enamel are added it will fog and blur whatever is behind it.