

Appalachian Center for Crafts - Clay Studio

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**Art 3520 - Advanced Clay Studio - Surface Design
Table and Explanation of Slip and Engobe Composition**

This table is adapted from *Clay and Glazes for the Potter* with some slight modifications. It provides a good general guideline to how the composition of slips and engobes vary when they are targeted for different applications and firing temperatures. All recipes total 100 parts plus 5% Zircopax for opacity.

Temperature Range	Cone 08-1			Cone 2-6			Cone 7-11		
State of Wares	Damp	Dry	Bisq.	Damp	Dry	Bisq.	Damp	Dry	Bisq.
EPK Kaolin	25	20	15	25	20	15	25	20	15
OM-4 Ball Clay	25	15	15	25	15	15	25	15	15
Calcined Kaolin		15	20		15	20		15	20
3134 Frit	20	20	20	5	5	5	5	5	5
Nepheline Syenite				15	15	15	10	10	10
G-200 Potash Feldspar							10	10	10
Talc	5	5	5	5	5	5			
Flint	25	25	25	25	25	25	25	25	25
Zircopax	5	5	5	5	5	5	5	5	5

Clay bodies for any temperature almost always contain at least 50% plastic clay, and the same is true of slips intended for application to damp greenware. However, when formulating engobes for application to bone-dry or bisque-fired wares where drying shrinkage has already taken place, formulas must be adjusted to decrease shrinkage of the slip coating. This is usually accomplished by decreasing the plastic clay content and substituting calcined kaolin. Calcined clay has been fired and then re-ground, so that it still contributes the same chemical constituents but is no longer plastic and thus does not shrink during drying. The balance of plastic clay to calcined kaolin serve to adjust the slip to fit the bone-dry or bisque-fired claybody, but with engobes applied to bisque-ware there can still be a problem with adhesion as the wares pass through the lower firing ranges, and additional fluxes (melting agents) are often added in small quantities to assist adhesion through these phases before the primary maturation flux kicks in. As you can see, the flux component changes for the different temperature ranges. In the low-fire range the fluxes are 3134 frit (a calcium-borate frit) and talc. In midrange the primary flux is nepheline syenite, a powerful soda feldspar, along with a small amount of 3134 frit help adhesion as the wares are fired through the low-fire range before the nepheline syenite kicks in. In the high midrange and high-fire the primary flux is potash feldspar, with a small amount of frit and nepheline syenite in the bisque engobe to help adhesion through lowfire and midrange temperatures. The minimum of 5% 3134 frit in all of the slips is intended to activate right at red heat and improve surface adhesion at all temperatures.