Technology Brief

GLASS CLAY BODY FLUX

As early as the 1970's, the United States Department of the Interior, Bureau of Mines, became interested in the possibility of using glass as a flux for brick clays. The Bureau of Mines' studies concluded that "Substitution of glass for one-half of the clay in a red [brick clay] body reduced the firing temperature 500°F [from 2120°F to 1650°F], which made possible a 30 percent increase in production."[1] These studies took place following the first energy crisis in the United States, when the Department of the Interior was interested in reducing energy use by targeted industries.

Seattle Pottery Supply

In January, 1998, Seattle Pottery Supply won a Technology Validation grant, funded by the United States National Institute for Standards and Technology (NIST), managed by the CWC. The purpose of the project was to develop some public information on the function of recycled glass as a body flux in clay bodies.

The facts that **soda lime glass is already a vitreous silicate, that vitreous silicates are generated during the maturation of clay bodies, and that vitreous silicates act as fluxes, reducing clay body maturation temperatures,** were strong evidence that the addition of soda lime glass to clay body raw materials could increase the efficiency of clay body firing and therefore be a value-added application for recycled glass fines.

[1] Tyrrell, M. E., and Goode, Alan H., "Waste Glass as a Flux for Brick Clays," United States Department of the Interior, Bureau of Mines, Report of Investigation 7701, 1972.

Key Words

Materials: Recycled Glass.

Technologies: Testing of recycled glass as a clay body flux.

Applications: Ceramic Fluxing.

Market Goals: Increased use for post-industrial and post-consumer glass.

Abstract: Evaluation of post-consumer waste glass as a ceramic raw material.

The Project

Six standard clay mixes sold by Seattle Pottery Supply were chosen for experimentation. The clay recipes were for multi-purpose clay bodies. They were chosen to represent a variety of firing temperatures and uses.

The mixes were designated:

- Δ06 Red
- Δ06 White
- Δ6 Red
- Δ6 White
- Δ06 Casting Slip

The symbol "Δ06" represents "pyrometric cone 06," or just Cone 06. The following temperatures correspond to the end points of the cones used in this project, when heated at 36°F per hour:

- Δ06 = 1841 °F
- Δ04 = 1922 °F
- Δ1 = 2057 °F
- Δ6 = 2174 °F

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The constituents of the standard mixes are contained in the full report. Each of the clay bodies was mixed in a 35lb. capacity clay mixer for approximately 40 minutes. All of the ingredients were first mixed dry until uniform, then a measured amount of water was added. After the clay was thoroughly mixed, it was wedged, or de-aired.

Samples were made by rolling the clay into a flat slab 1cm. thick. Test samples were cut from this slab to 5cm wide by 30 cm long. After drying, all samples were fired to the desired temperature (or cone) using a programmable kiln controller. After firing, shrinkage and absorption tests were performed.

Results

Graphical results correlated with percentage substitutions are shown in the full report.

Care must be taken in making assumptions or attempting to reproduce the results. Conducting these tests in potters' kilns is not an exact science. Mixing and firing properties of clays vary depending on many factors.

Two trends can be discerned from the results. First, the line for shrinkage vs. percent substitution of glass is fairly flat. This means that the amount of shrinkage of the clay body was relatively unaffected by the glass substitution. In contrast, the line for absorption drops significantly with increasing percentages of glass. Lower absorption correlates to both increased strength and improved resistance to freeze/thaw cycles. Lower absorption is also indicative of lower temperature clay body maturation during firing.

In general, these results support the work of the Bureau of Mines cited above, to the effect that using glass as a clay body flux lowers the maturation temperatures of clay bodies.

Example

The components of Δ06 Red were:

Component	Weight percent
Red Art Fireclay	55.0
Old Mine 4 Ball Clay	27.5
Barium Carbonate	.4
Bentonite Clay	1.0
Clay Grade Iron	2.2
Talc	13.8
Material substituted for:	Talc

The chart below shows the results for this standard mix with glass substitutions for talc.

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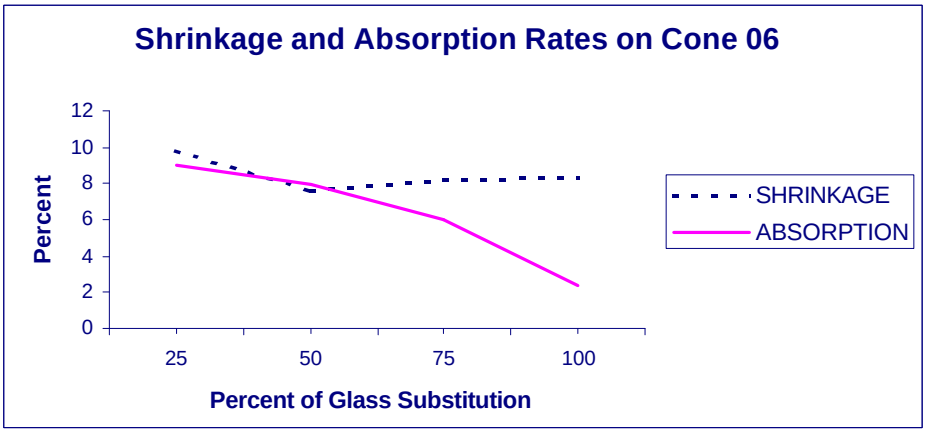

For More Information

For a copy of the report, *Glass Clay Body Flux (No. GL-99-1)*, use the CWC Publication Order Form. For more information call CWC at (206) 443-7746, email info@cwc.org, or visit the CWC Internet Website at www.cwc.org.

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CWC is a division of the Pacific NorthWest Economic Region, 2200 Alaskan Way, Suite 460, Seattle, Washington, 98121