



Conserve O Gram

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Preservation Of Low-Fired Ceramic Objects

To better protect low-fired ceramic objects, museum staff should understand the materials and techniques used to create them. Some of the damage that can occur to low-fired ceramics is a result of their construction. Prevent major accidents by following established guidelines for proper handling, storage, and display. Ask a conservator to evaluate the causes of glaze loss, damage to surface decoration, and staining.

The Nature of Low-Fired Ceramics

Low-fired ceramic objects (earthenware or terracotta) are composed of clays and additives that begin to fuse or melt at temperatures between 900° - 1200°C (1652° - 2192°F). After firing, the clay body is no longer water-soluble but remains porous to water. Porous earthenware is more resilient and less brittle than high-fired ceramics such as porcelain.

Glaze

The application of a glaze (a glassy impermeable layer) allows earthenwares to hold liquids. The glazes used on low-fired ceramics do not fully fuse or melt to the clay body. This means that the glaze can chip off the ceramic since it is not chemically bound to the body.

During firing, clays and glazes expand and contract. Rates of expansion and contraction depend on the composition of the glazes and clays. Ideally, rates for the body and glaze will be very similar. If the expansion and

contraction rates are too dissimilar, then fine breaks or crackle patterns (“crazing”) will form in the glaze. A crackle pattern may be an intentional decoration, but it represents a weakness in the glaze layer. Breaks in the glaze also occur from blows and rapid heating or cooling. These breaks allow liquids to penetrate into the body and cause the glaze layer to detach. Colored or oily liquids may cause staining beneath the glaze, and salts in liquids can also cause deterioration.

Note: Never use tape to hold ceramic fragments together. The tape can lift the glaze from a low-fired ceramic.



Figure 1. Ceramic object with glaze loss

Slips

The presence of a slip (an extra clay layer over the body and below a glaze) further promotes glaze loss. The slip does not turn glassy, but remains a soft layer separating the overall glaze and the body. A slip disguises the body color and permits multicolored decoration. Sgraffito ware is an example of a ware with a slip layer. The glaze stays in place over the slip by compression and tension. Frequent handling can break this tension and lift off the glaze.

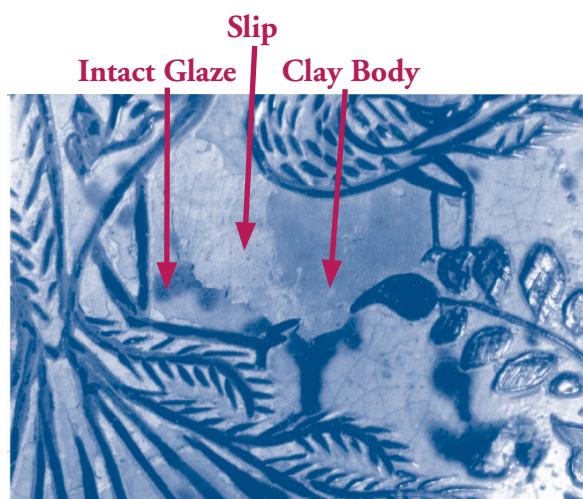


Figure 2

Overglaze

The temperatures necessary for firing can destroy bright glaze colors. Applying an overglaze or enamel to an already fired and glazed object creates colorful surface decoration. The overglaze, which usually contains ground glass (frit), colorants, and sometimes clay, melts at a lower temperature than the overall glaze and body. Overglaze is weakly attached to the glaze because it gets a separate firing. If the overglaze is thickly applied, or contains many bubbles or flaws, it is vulnerable to damage by abrasion.

Note: Do not stack ceramic dishes. The unglazed, rough foot rim can abrade the overglaze on the object below.

Gold Decoration

Earthenwares with gold surface decoration (gilding) are fired at temperatures not exceeding 600°C (1112°F). Gilding is very weakly adhered and fragile. When handling or treating objects with gold decoration a conservator should:

- never apply tape because it will readily remove gilding
- keep contact with surviving gold to a minimum because of its fragile nature
- never re-fire ceramics to replace lost gilding

Conservation Treatment for Low-Fired Ceramics

A conservator may be able to offer several options for the stabilization of deteriorated low-fired ceramics. These include consolidation, stain removal, and bleaching.

Note: Only a qualified conservator should undertake the treatment of ceramics.

Consolidation

Loose glaze or edges around losses may require local or overall consolidation to prevent further loss. Consolidation is the introduction of a dilute adhesive into a body, slip layer, or under the glaze. It is an invasive and serious treatment because it is not entirely reversible. Consolidation should occur only when necessary, using the highest conservation quality adhesive that is effective and safe. A good consolidant will:

- age well
- not change color
- remain soluble
- not alter the appearance of the object

Stain Removal

Staining occurs when colored liquids soak into unglazed earthenware or seep under the glaze.

Stains are difficult to identify and remove. They may be mixtures of food, cleaning agents, or soil. Oils and fats from food will darken in color, and over time, become insoluble. Some beverage stains, such as tea, act as dyes. Adhesives, fillers, and paints used in repairs also can cause staining.

Stain removing agents containing oil are not conservation quality or recommended for use. A conservator should remove stains only if the staining prevents display or treatment. Safe removal of stains is difficult because of the following:

- inaccessibility of stains inside the body
- inability to identify stain material
- insolubility of the stain
- harshness of solvent or chemical necessary to dissolve the stain
- cleaning solvents may dissolve intentionally added elements in the body

In addition, controlling the movement of dissolved stains can be a problem. In some situations, stains may spread out or diffuse rather than disappear. This can leave an overall discolored body rather than a localized spot on a clean object.

Bleaching

An alternative to removal of stains is bleaching. Bleaching alters the color of the stain, but does not remove it. The stain remains in the body, so it may unpredictably return over time. Antiquated housekeeping tips recommend using chlorine-containing bleaches or lye to remove stains. Using these products will irreparably harm the body and will cause soluble salt contamination if not thoroughly rinsed out. See *Conserve O Gram 6/5*, “Soluble Salts and Deterioration of Archeological Materials” for more information on damage to ceramics.

Past Treatments and Repairs

Agents used in treatment must not damage the object. Treatment materials should be removable without causing damage. Older repairs or restorations often do not meet these standards. In the past, adhesives and binders were primarily natural resins, such as shellac, dammar, or mastic, or animal products such as hide glue. These products, while initially effective, do not age well and break down, discolor, and/or become less soluble.

To supplement weak adhesives, metal rivets or staples were used to repair ceramic and glass objects. Conservators rarely use metal rivets today. Rivets are a damaging and aggressive repair method that requires drilling holes on both sides of the break. The rivet is placed into the holes to secure the join by pressure. The hole is then backfilled with plaster or other filler. The staples can be made of copper or iron alloys. Frequently iron rivets are corroded or rusty, staining the ceramic and sometimes failing. If the alignment of the join is good and the rivets are not corroded or visible, they can remain in place. If alignment is poor or rivets are corroded a conservator may remove the rivets during treatment.

When selecting a treatment for a low-fired ceramic that exhibits a weak or damaged surface, several options are available. Reduced and/or improved handling may suffice. If treatment is necessary for preservation, the curator and conservator should work together to choose the safest and most effective method.

References

Buys, Susan and Victoria Oakley. *The Conservation and Restoration of Ceramics*. Oxford, England: Butterworth-Heinemann, 1993.

Little, Margaret. "Ceramics and Glass." In *The Winterthur Guide to Caring for Your Collection*. Winterthur, Delaware: Winterthur Museum, 2000.

National Committee to Save America's Cultural Collections. *Caring for Your Collections*. New York: Harry N. Abrams, 1992.

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