CHAPTER-4

GLAZE DEFECTS
AND
THEIR SOLUTIONS
4.1. GLAZE DEFECTS

Glazes do not always come out as desired but are accumulated by several
defects. Some glaze defects are shown below.

4.1.1. Crazing

Crazing is the glaze defect in which a network of cracks develops in
the fired glaze. These cracks are often very fine, but can also be
quite severe. Crazing is generally undesirable however, certain
glazes, referred to as crackle glazes, are specifically composed to
develop a controlled form of crazing. Crackle glazes should never
be used on the interior of any sample that is able to hold liquid or
foodstuffs.

4.1.1.1 Causes of Crazing.

This fault is usually caused by a glaze that is too small (large
coefficient of expansion) for the clay body. The glaze
contracts more than the clay body as they cool from their
maturation temperature in the kiln. The resulting tension in
the glaze causes it to crack. Other common causes are:

- Thermal shock due to abrupt and significant temperature changes

- Over firing of a pot, which can melt the silica in the clay
  body, changing its coefficient of expansion

- Expansion of the clay body due to absorption of moisture
  after firing, if the clay body is porous and has unglazed areas

- Poor fit between the clay body and the glaze.
4.1.1.2 Solutions for Crazing.

Crazing can be solved by using one of the following methods

a. By changing the firing cycle.
Crazing may be solved or reduced by firing to a higher temperature or by introducing a longer soak at the end of the firing cycle. If the sample firing to a point where the clay body is partially vitrified for example, porcelain, increasing the temperature or soak may actually increase the problem.

b. By changing the glaze.
If the crazing is due to a mismatched glaze and clay body, the best solution will be to modify one or the other's coefficient of expansion.

Glazes can be modified by:

- Increasing the silica
- Reducing the feldspar (or soda or potassium in general)
- Increasing the boron or alumina content.

c. By changing the clay body.
Generally speaking, a fairly moderate increase in the amount of silica in a glaze will correct the glaze defect. If, however, there is a marked soda or potash content it may be more practical to modify the clay body, in one of the following ways:

- For low-fire clay bodies, increase the soda or potash
- For high-fire clay bodies, the most practical method of curing crazing may be to increase the silica in the clay.
4.1.2 Crawling

Crawling is a glaze defect in which the glaze separates, leaving portions of bare clay exposed. These can be a few tiny areas, or it can extend across the surface of a sample. Extreme cases may result in the glaze leaving the surface of the sample completely. Droplets or even puddles of glaze may end up on the kiln shelf.

4.1.2.1 Causes for Crawling

Crawling occurs when the glaze has not properly adhered to the bisqued clay. The most frequent cause is that the glaze was applied to dirty, dusty or greasy pots. Other causes for crawling are

- Too thick a glaze coat
- Glaze coats which have dried too quickly, such as forced drying in a warm kiln
- Second glaze coats applied too wet to an already dry layer of glaze
- Raw glaze coats which dry excessively and begin cracking on the bisqueware before the glaze firing
- Heavy applications of underglaze
- Too much opacifier in the glaze
- A furnished or too smooth surface on the bisque ware
- A lack of adhesiveness in the raw glaze.

Matte glazes that have a high clay or calcium borate content are more likely to crawl because they are highly viscous glazes.
4.1.2.2. Solution for Crawling

One general solution to crawling is to thin the glaze with by adding water or by applying less glaze.

4.1.3 Blistering.

Blistering is a glaze defect similar to pinholing and pitting. As the glaze melts, gases vaporize out of the clay and glaze. Blisters are the result of the glaze being frozen in the midst of boiling.

In most instances, this out-gassing is completed and the glaze flows back together to form a smooth surface by the time the kiln has reached temperature. However, too much gas or too viscous a glaze may interfere with all the gas being released in time for the glaze to smooth back out. In such cases, blistering is likely to occur.

4.1.3.1 Causes for blistering.

The most common reason for blistering is an overly thick application of glaze, especially if the glaze has pooled at the bottom of the sample. Firing too hot or too quickly at the end of the cycle can also contribute to glazes blistering. Certain ceramic materials are also prone toward blistering. Lead is especially sensitive to atmosphere and any lack of oxygen in the kiln will cause it to gray out the colors, blacken, and blister. Borax, potassium carbonate, magnesium sulphate, soda ash and fluorine can produce large amounts of out-gassing and hence cause blistering.

4.1.3.2 Solution for blistering

- Greenware is properly bisque at a high enough temperature (up to cone 04), eliminating those gases.
Do not apply glaze too thickly.

- For one-coat dip glazing, bisqueware should be in the glaze for no longer than a three-count.
  Firing schedule should not be too fast. Extend the time of the soak (keeping the kiln at the maturation temperature for a time before shutting down). The soak can be extended up to a half hour in total.

- Use frits instead of raw ingredients in glaze, or substituting other fluxes.

- Increasing slightly the glaze's flux.

4.1.4 Pin-holing and Pitting

Pin-holing and pitting are glaze defects in which the glaze comes out of the kiln with one or more pits in its surface. Pinholes are the smallest of these pits.

4.1.4.1 Causes for pin-holing and pitting

All glazes contain volatile materials and will undergo a certain amount of agitation as these burns off during firing. Most pinholes and pits are due to this off-gassing. Under-firing a glaze can leave it with pin-holing and pitting. The matte glazes are more subject to pin-holing and pitting, since they are glazes made to purposefully be under-fired. Other contributors to pin-holing and pitting include high levels of zinc or rutile in the glaze. In addition, if the kiln enters into reduction during the early stages of firing, carbon may be deposited on the ware and can contribute to pin-holing and pitting as it later burns off.
4.1.4.2 Solving pin holing and pitting

Increase the overall firing time.

- Increase the soak time at the end of the firing cycle.
  Apply the glaze more thinly.
- Add a small amount of flux to the glaze.
  Increase the final temperature you fire to.
- Reduce the rutile or zinc in the glaze, if any is present.
  Ensure that, while using a fuel-burning kiln, the kiln does not enter reduction during the early stages of the firing cycle.

4.1.5 Shivering

Shivering is a glaze defect in which slivers or flakes of glaze detach themselves from a pot. When shivering occurs, it is most frequently seen on thin rims and edges.

4.1.5.1 Causes for shivering

Shivering is usually due to the exact opposite situation that causes crazing. The glaze coat is too large (having too small coefficient of thermal expansion) for the sample. Another possible reason for shivering is over-reduction, especially of red clay bodies that are more susceptible to carbon coring.

4.1.5.2 Solution for Shivering

- Decrease the silica in the glaze
  Increase the feldspar in the glaze
- Do not allow the kiln to go into excessively heavy reduction.
REFRENCE

12. Liang Aimin Wei Mingkum, Several Problems Noticable in preparing Crystalline Glaze, Jiangu Ceramics, ISSN 1006-7337.0 2002-04-011.