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Experimental Study of Olive Wood Ash Glazes in High-Temperature Ceramics

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Abstract:

Ash glaze is a glaze made from the ash of various types of wood or straw. It has been historically important in East Asia, especially Chinese pottery, Korean pottery, and Japanese pottery. Many traditional pottery factories in East Asia still use ash glaze, and it has seen a great revival in studio pottery in the West and East. Through the study, olive ash wood was used and some auxiliary materials were added to obtain wood ash glaze. Wood ash glaze has natural colors that can be improved to a certain extent by adding some oxides. Only this will give color, while the effects of wood ash are controlled primarily by the kiln atmosphere and the firing temperature**.**

Key words: Ash Glaze, Olive Wood Ash, Ceramic Materials, High-Temperature Firing, Surface Effects

Introduction:

Ash glaze is a type of glaze used in pottery and ceramics, known for its natural, organic appearance and distinctive texture. The origins of ash glaze can be traced back to ancient China, where it was used by potters in the Song dynasty (960-1279).

OBJECT DESCRIPTION: A look into a more modern Incense Burner. This pottery used as an incense burner is made of Jun ware. Jun ware is a type of celadon. It is made out of straw ash in the glaze, which gives its unique blue glaze cover with white. PERIOD: Song dynasty (960–1279). LOCATION: China. Artist: unknown

In traditional ash glazing, potters would mix ash from wood fires with a mixture of clay and water to create the glaze. This glaze was then applied to the surface of the pottery, where it would fuse with the clay body during firing. The ash in the glaze would partially vaporize during firing, leaving behind minerals that would react with the clay body to create unique patterns and textures.[1]

Ash glaze has been used in various forms throughout the world, including in medieval Europe, where it was a common technique used by potters. In the United States, ash glaze became popular during the American Arts & Crafts movement of the late 19th and early 20th centuries, when artists and potters sought to revive traditional techniques and styles.

Today, ash glaze is still widely used by potters and ceramic artists, who appreciate its natural and organic appearance. While the traditional method of using wood ash to make the glaze has largely been replaced by more modern techniques, ash glaze remains a popular choice for those looking to create rustic and earthy pieces.[3]

To make ash glaze, you will need:

Ingredients:

Wood ash

Clay

Sodium feldspar:

In ash glazes, feldspar is typically used as a flux to help the glaze melt and fuse to the clay body of the pottery. Some common feldspars used in ash glazes include potassium feldspar, such as K-feldspar or nepheline syenite, and sodium feldspar, such as albite or soda feldspar. [5]

It's important to choose the right feldspar for a particular ash glaze, as different feldspars have different melting temperatures and chemical compositions that can affect the final appearance of the glaze. Potassium feldspar, for example, is a high-flux mineral that melts at a relatively low temperature, making it a good choice for ash glazes. Sodium feldspar, on the other hand, has a lower flux content and a higher melting temperature, which makes it more suitable for use in glazes with a more robust structure. [2]

Ultimately, the choice of feldspar will depend on the desired properties of the ash glaze, such as its melting temperature, color, transparency, surface texture, and other factors.

Chemical Analysis (Weight percent) of defferent Kinds of Ash:

	Wood (Cyp)	**Grass (Straw)**	**Olives wood**
Na2O	9.12	1.4	0.6
K2O	14.00	13.6	13.7
Mno	12.01	2.5	3.4
CaO	30.02	5.8	2.9
Al2O3	0.13	-	1.2
siO2	15.30	6.5	10.2
Fe2O3	2.40	0.66	0.9
MgO	0.10	-	0.6

Instructions:

Collect the wood ash: You can use any type of wood ash, but some types, such as oak or Olive, are preferred because they produce ash with high levels of potassium and other minerals that are beneficial for glaze formation.

Sift the ash: Sift the ash through a fine-mesh sieve to remove any large particles and impurities.

While the ash of most plants is very high fluxing Oxides like Cao and MgO, some plants take up much more free silica from the soil and have ash that can be high in silica particles (e.g. rice husk ash). Prolonged breathing of such exceptionally fine particled ash over time can cause silicosis. When added to glaze suspension the ash will generally create a caustic and corrosive base that can cause skin reactions in some people (even severe reactions), thus is best to wear rubber gloves when working with ash glazes.

Mix the ingredients: In a large bowl, mix together the sifted ash, Clay, feldspar,in the ratios of about 40-50% ash, 40-50% kaolin, 5-10% feldspar, and 5-10% silica. The ratios can vary depending on the desired effect.

Grind the mixture: Use a ball mill or mortar and pestle to grind the mixture into a fine powder. A ball mill is ideal for achieving a consistent particle size, but a mortar and pestle can be used if a ball mill is not available. [7]

What temperature is ash glaze fired?

Ash glaze is typically fired at high temperatures, usually between cone 8 and cone 11 on the Mohs scale, which is equivalent to approximately 1980 to 2120 degrees Fahrenheit (1083 to 1280 degrees Celsius). The exact firing temperature for an ash glaze will depend on several factors, including the specific recipe for the glaze, the type of clay body being used, and the desired final result. It is important to carefully control the firing temperature and atmosphere during the process to ensure the best results.[5]

Can charcoal ash Glaze be used for dinnerware?

Yes, charcoal ash glaze can be used for dinnerware. Charcoal ash glaze is a type of glaze made by mixing wood ash with other ingredients to create a glaze that is typically applied to ceramics. The wood ash in

the glaze contributes to the unique texture and appearance of the glaze, and the resulting pieces are often considered to be artistic and unique.[2]

However, it is important to note that not all charcoal ash glazes are food safe. Some glazes contain lead or other toxic materials, and therefore should not be used for dinnerware. It is important to use only food-safe glazes for dinnerware and to follow proper glazing and firing techniques to ensure the safety of the pieces.

It's always a good idea to check with the manufacturer or the person who made the piece to make sure that it is food safe and meets all relevant health and safety standards.[6]

Precautions to be taken when dealing with ash Glaze?

Coal ash glaze is a type of ceramic glaze that contains high levels of heavy metals and other toxic substances. When dealing with coal ash glaze, it is important to take the following precautions to ensure your safety:

Wear protective gear: When handling coal ash glaze, it is important to wear gloves, a mask, and protective clothing to prevent skin and inhalation exposure to the toxic substances.

Avoid skin contact: Try to avoid direct skin contact with the coal ash glaze as it may cause skin irritation or other health problems.[9]

Ventilation: Ensure that the area where you are working is well-ventilated to reduce inhalation of any toxic fumes that may be released during the firing process.[1]

Ash glaze in electric kiln

Ash glaze is a type of glaze that is made from wood ash and is applied to pottery to create a unique, natural-looking surface. To fire an ash glaze in an electric kiln, the following steps should be followed:

Clean and dry the pottery: Before glazing, make sure that the pottery is free from any dust or debris.[4]

Mix the ash glaze**:**

Mix the ash glaze according to the recipe you are using. The basic recipe for ash glaze includes wood ash, feldspar, and Clay.

Apply the glaze: Brush or pour the ash glaze onto the pottery, making sure to cover the surface evenly.[8]

Load the kiln: Carefully place the glazed pottery into the kiln, making sure that it is secure and that there is adequate space between each piece.

Set the firing schedule: Program the electric kiln with the appropriate firing schedule for the ash glaze. The firing temperature and time will vary depending on the specific recipe you are using.[3]

Fire the kiln: Turn on the kiln and begin the firing process. Monitor the kiln throughout the firing to make sure that it is working properly.[3]

Cool the kiln: After the firing is complete, allow the kiln to cool down gradually. This will prevent thermal shock and ensure that the ash glaze sets properly.

Remove the pottery: Once the kiln has cooled down, carefully remove the pottery and inspect the results. If necessary, make any adjustments to your firing schedule for future batches of ash glaze.[4]

Some of the works carried out using the coal ash coating method

This ash glaze contains no iron but does have a little cobalt (e.g. 0.25%). The ash is about 50%, with 20% EP kaolin and 25% Custer feldspar and a little rutile (2-4%). If your attempted glaze does not melt

well enough consider substituting some of the feldspar for Gerstley Borate or a low melting low expansion frit. If it melts too much add a little silica at the expense of the feldspar.

H463 with a wood ash glaze. This ash glaze version was just the cone 6 version (referred to elsewhere on this page) fired to cone 8. The higher temperature produced much more variegation in this rutile and cobalt version of the recipe. A thicker application on the outside caused cracking during drying, that produced crawling that added to the aesthetic. By Tony Hansen.[6]

Practical side.

Due to the need to use high temperatures, it was necessary to use special clays for this purpose. Through practical experiments, it was decided to deal with kaolin clays because of their properties that make them suitable for this purpose, due to their ability to withstand high temperatures. Then, a small percentage of Soda feldspar and Local Clay were added. [7]

Considerations for Mixing

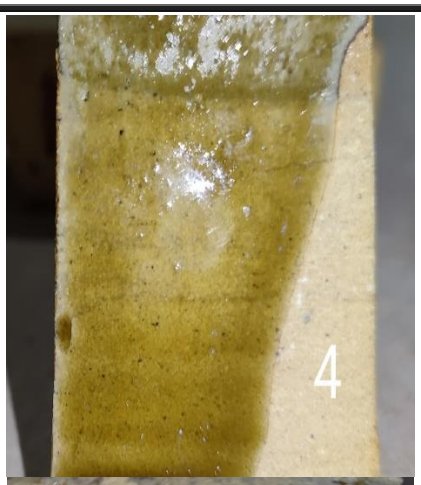
1. **Preparation**:
   - Ensure the ash is well-sieved to remove any large particles, which could affect the glaze's smoothness.
   - Mix thoroughly to achieve a uniform consistency.
2. **Testing**:
   - Always conduct test tiles before applying the glaze to larger pieces. This allows you to evaluate color, texture, and durability.
3. **Additives**:
   - You might consider adding a small amount of flux (like feldspar) if you want to enhance fluidity or alter the melting characteristics.

Sample number	1	2	3	4	5	6
Ash wood	60%	55%	50%	45%	40%	49%
Local Clay	40%	45%	50%	55%	60%	24%
Soda Feldspar						27%

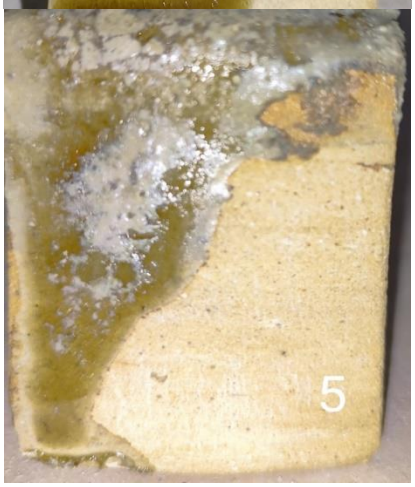
Ash wood	60%
Local Clay	40%

Ash wood	55%
Local Clay	45%

Ash wood	50%
Local Clay	50%



Ash wood	45%
Local Clay	55%



Ash wood	40%
Local Clay	60%

Ash wood	49%
Local Clay	27%
Soda feldspar	24%

Result

Ash glaze is a type of ceramic glaze that uses wood ash as a primary ingredient. When ash is melted and combined with silica and other materials, it creates a natural glaze that can enhance the visual and functional qualities of ceramics.

Composition

1. **Types of Ash**: Different types of wood (hardwoods vs. softwoods) produce varying ash compositions. Common types include:
   - Olives wood

2. **Key Components**:
    - **Silica (SiO_2)**: Provides glassy structure.
    - **Alumina (Al_2O_3)**: Stabilizes the glaze.
    - **Potassium (K_2O) and Sodium (Na_2O)**: Fluxes that lower the melting point.
3. **Additives**: Sometimes, additional materials (like feldspar or clay) are mixed in to modify the glaze properties.

Properties

- **Color Variability**: Ash glazes can produce a range of colors depending on the wood source and firing conditions. Common results include earthy tones, greens, and blues.
- **Texture**: The ash can create a varied surface texture, ranging from smooth to rough, depending on the composition and application technique.
- **Interaction with Clay Body**: The reaction between the ash glaze and the clay body can lead to interesting effects, including streaking and mottling.

Research Findings

Firing Temperature:

1. The optimal firing temperature may vary, but generally, you'll want to fire in the cone 6 to cone 10 range (1222°C to 1280°C). Experimenting within this range can help you find the best results for your specific materials. Application Techniques
2. **Durability**: Ash glazes tend to be durable but can be prone to crazing (fine cracks) if not properly formulated.
3. **Environmental Impact**: Research into sustainable practices has highlighted the use of local or waste wood ash as a resource for glazes, reducing the carbon footprint associated with commercial glaze materials.
4. **Cultural Significance**: Many cultures have traditional techniques for using ash glazes, and modern research often aims to preserve these practices while innovating new applications.

Conclusion

Research on ash glazes continues to evolve, focusing on material properties, environmental sustainability, and artistic expression. As ceramicists explore these glazes, they contribute to a deeper understanding of materials and their potential in art and functional ware.

Combining 49% wood ash with 24% local Clay and 24% Soda Feldspar in an ash glaze formulation can yield interesting results.

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