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A Summary of the Comparative Study of Lead-Glazed Pottery in Han Dynasty and Ancient Egypt

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Abstract: *During the reign of Emperor Wudi of the Western Han Dynasty, lead-glazed pottery was successfully fired in China. Compared with previous pottery, glazed pottery was more suitable for use because of its advantages of low water absorption and high finish. However, in the world, the use of glazed pottery technology first appeared not in China, but in ancient Egypt, so there is also a saying that the lead glaze technology on the Han Dynasty pottery was spread from the western regions, rather than the invention of Chinese craftsmen. In this article, the author will try to make a comparative study and analysis of lead-glazed pottery in Han Dynasty and ancient Egypt from the aspects of process principle, product use and aesthetic fashion.*

Keywords: *Lead-glazed pottery, Han Dynasty, Ancient Egypt*

1. Introduction

Archaeological work over nearly a century unfolds, the country has discovered hundreds of thousands of Han dynasty tombs, buried with the amount of lead glazed pottery is impressive [1], in ancient Egypt, lead glazed pottery had become the mainstream in the grave [2], with the deepening of research, source of lead glazed pottery craft battle intensified, some people think that China's lead glaze technology is introduced from the western regions, Some people think that it was created and fired by our country, but there are few systematic comparative studies on the two kinds of lead glazed pottery in the current literature. Therefore, this paper makes a comparative analysis of the two kinds of lead glazed pottery, and sorts out the two viewpoints and arguments of the dispute on the source of lead glaze technology.

2. The Lead-glazed Pottery of the Han Dynasty

In China, lead-glazed pottery first appeared in the Guanzhong area during the period of Emperor Wu of the Han Dynasty, and then quickly became popular all over the country. Green, yellow or brown pottery, because the impurities in iron minerals were not easy to remove at that time, and copper was used as a colorant to appear green, which is known as green-glazed pottery [3]. The successful firing of lead-glazed pottery not only greatly improved the quality of pottery at that time, but also opened a precedent for later generations of three-color glazed pottery, which is an important achievement in the history of pottery making in the Han Dynasty.

Lead-glazed pottery is named after the use of lead as a co-solvent in the glaze. The lead-glazed pottery in the Han Dynasty was usually prepared with lead and quartz in a ratio of 3:1. The use of lead in the glaze not only reduced the firing of the glaze temperature, while also improving the finish of the glaze surface. This is because the lead glaze has high fluidity and low high-temperature viscosity, which can avoid the common defects such as "orange peel" and "pinhole" in lime glaze and lime-base glaze. At the same time, the high refractive index of the glaze makes the The glaze layer is shiny and transparent, and the melting temperature range of the glaze is wider, which reduces the difficulty of firing and improves the yield of glazed pottery.

The body material of lead-glazed pottery in the Han Dynasty is ordinary clay. The firing temperature is low, between 700 and 850 ℃, which makes the glaze soft, also known as soft glaze. The firing in oxidizing atmosphere makes the copper in the glaze appear emerald green, and the iron in the glaze appear yellowish brown and brownish red. The test results show that the composition of the glaze in the green glazed pottery of the Eastern Han Dynasty is silicic acid accounts for 29.91%, alumina accounts for 65.45%, ferrous oxide accounts for 0.80%, copper oxide accounts for 2.60%, and alkali metal oxides

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such as calcium, potassium and sodium account for 0.94% [4].

During the Eastern Han Dynasty, glazed pottery was very popular, but because of the poor chemical stability of glazed pottery, it was mostly used as a burial ware. During this period, the style of thick burial prevailed, and the power of powerful landlords grew, which greatly promoted the development of glazed pottery. The main types of glazed pottery are: utensils (including pots, jars, washers, basins, warehouses, wengs, boshan stoves, etc.), pottery sculptures (including ducks, dogs, chickens, figurines, pigs, etc.) The dock building (Figure 1), the high gate, the residential garden, the servants and the giant sculptures of the luxurious and luxurious life scenes, etc. After being buried underground for a long time, the surface of these buried glazed pottery often has a silver luster. This is because the lead in the glaze precipitates under the action of water and the atmosphere and adheres to the surface of the glaze layer in the form of metallic lead.

Figure 1: Green Glazed Pottery Building, Eastern Han Dynasty, Collection of Hebei Provincial Institute of Cultural Relics and Archaeology

The glazed pottery of the Han Dynasty gradually matured after the development of later generations. From the initial period of only green, brown-yellow and other single-color glazes, to the Wang Mang period, the two-color glazes of green, yellow, brown, and red sauce appeared at the same time, and developed in the Tang Dynasty. The splendid Tang Sancai appeared, showing a variety of colors such as green, yellow, white, blue, black, and brown. After the Song Dynasty, with the prosperity of porcelain, the development of glazed pottery gradually declined, but it still continued.

As a product of the first golden age of arts and crafts after the unification of ancient China, the glazed pottery of the Han Dynasty is solemn and elegant in shape, concise in lines, and bright in color, reflecting the unity of function and aesthetics. The vivid pottery art has shaped the images of characters from all walks of life, and the rich utensils and objects reflect the way of life of the people at that time. The handicraftsmen in the Han Dynasty were the slaves living at the lowest level of society. They created for a long time and practiced superb skills. The high-rise corridors, fine wine, singing and dancing showed the extravagant life of the imperial aristocracy, music and dance, competition, and rich folk. entertainment life. Therefore, glazed pottery works are image materials for the study of pottery craftsmanship and social history in the Han Dynasty. They are both precious works of art and profound cultural significance.

3. The Lead-glazed Pottery of the Ancient Egypt

As one of the four ancient civilizations, ancient Egypt, in 3000 BC in the neolithic age in pottery, at the time of the ancient egyptians to the Nile river on both sides of the black clay and development made the black pottery, after the invention of wheel system technology, and gradually appeared bright shadow pottery, tacitly Ming pottery and glazed pottery flower. The year 2000 BC was the period of the New Dynasty in ancient Egypt. During this period, the social life was rich, which was reflected in the pottery,

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showing the richness of the types and the innovation of the types. Potters created and burned the pottery which was painted with manganese material under the green glaze. In the 2nd century AD, lead-glazed pottery with lead as a flux was prevalent along the Mediterranean coast. It was turquoise and lapis lazus [5].

On the body, Egyptian lead-glazed pottery was always made of clay. On glaze, lead glazed pottery is similar to the han dynasty, the ancient Egypt's lead glazed pottery is also lead as cosolvent, copper oxide as colorant, in oxidizing flame burn, is different from lead glazed pottery of the han dynasty, because Egypt lead glazed pottery glaze lead in alkali points less and more, so affected the cupric oxide colour to make it more blue, around in principle, Copper oxide is cyan in glazes rich in alkali metals and green in glazes rich in acidic elements. However, if the composition of the glaze is not rich in silicic acid, it is difficult to adhere to the body, because the glaze with more alkali metal content is easy to be affected by the moisture in the air and peel off, so there are few jade glaze ceramic products in the Song Dynasty intact.

In green glaze is even more rare than green glaze, dominated by blue glazed pottery of ancient Egypt, on the one hand is because, in ancient Egypt, glazed pottery is used as a substitute for other valuable minerals, such as lapis lazuli from Afghanistan and turquoise from the sinai peninsula, on the other hand, blue is a symbol of the Nile river in ancient Egypt, the house of baal, blue sky, sacrifices and fertile.

Ancient Egyptian lead-glazed pottery was rich in shapes, such as bowls and boxes for practical purposes, shrines and statues for sacrifices, and scarabs and amulets for funerals. For example, the glazed pottery bowl collected in the Egyptian Museum in Turin (Figure 2) has a green glaze on the surface of the pottery body. In full bloom, a bud is ready to bloom, implying prosperity and rebirth. The charms used as burial objects usually include the statue of the four sons of Horus, the statue of the patron saint of Isis (Figure 3), etc. In ancient Egypt, Isis was regarded as the patron saint of children and pregnant women, and was an important goddess at that time. one. In addition, the tombs also include some small objects, such as shabti figurines, urns, etc., to help the tomb owner live a better life in the underworld. With the prevalence of the concept of thick burial, the number of such products is also increasing.

Figure 2: Glazed bowl, New Kingdom Period, 18th dynasty (1550-1295 BC)

Figure 3: Amulet of the goddess ISIS, glazed pottery, Post-Dynastic period (664-332 BC)

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4. The Dispute Over the Technological Source of Lead-glazed Pottery

Taking a comprehensive look at the history of glazed pottery in the world, the application of low-temperature glaze on pottery was not the first in China, so many scholars believe that lead glaze technology in the Han Dynasty was introduced from ancient Egypt through West Asia. For example, Ye Zhimin and three Japanese men all believe that the ancient Chinese lead glaze technology is probably the result of the introduction from the Western regions. The main reasons for this point of view are as follows: Firstly, glazed pottery was developed in China roughly during the period of Emperor Wudi of the Western Han Dynasty. During this period, the Silk Road connected China with the West, and glazed sand technology was probably introduced to China through the Silk Road. Secondly, the Western sand glaze technology is dominated by minerals containing sodium and calcium, while the original sand glaze technology is dominated by minerals containing potassium and barium. The two are generally similar in process principle, and the difference in raw materials should be caused by the difference in easy access to raw materials, namely: When the ancient Western glaze sand technology was introduced into Guanzhong region, due to the lack of sodium containing minerals as raw materials for glaze, potassium containing materials (such as plant ash, saltpeter, etc.) were used to replace it. The opening of the Silk Road in the Western Han Dynasty promoted the spread of glaze and sand technology from west to east, which was not only the spread of technology, but also the exchange of culture.

In contrast, there are many scholars who support the view that the lead glaze technology was invented by the Chinese themselves. Studies have shown that the use of lead as flux of history can be traced back to the earliest primitive society, unearthed in the archaeological culture of the lead content of 5% lead bronze, show that in the process of bronze ware production, add a certain percentage of lead, in order to reduce the melting point and improve the physical properties of bronze is the shang dynasty had to master the technology. During the warring states period, women make up with white powder is used to turn lead into technology of lead carbonate and qin and han dynasties, Taoism blast technology is also likely to include the burning of lead smelting, these are fully explained, in ancient China, craftsmen have mastered technology of metallic lead to oxidation and carbonate, also very likely, in the long-term practice, The formation rules and characteristics of lead glass materials were mastered by high temperature chemical reaction of lead with clay, sand and other substances containing silica, which was introduced into the production of pottery and thus lead glazed pottery was invented.

5. Conclusions

Whether in the Han Dynasty or ancient Egypt, lead-glazed pottery lowered the firing temperature of the glaze due to its low melting point, and improved the smoothness of the glaze surface due to its better fluidity, thus giving the traditional plain pottery a brilliance. It is only due to the difference of local raw materials and different social aesthetic trends that lead-glazed pottery in the Han Dynasty was dominated by green glaze, and lead-glazed pottery in ancient Egypt was dominated by green glaze. The potters in the two places also developed a rich variety of utensils through long-term practice, but they were mostly used as burial objects due to the poor chemical stability of lead glaze. As for where the lead-glazed pottery technique came from, in fact, after the opening of the Silk Road, the culture from West Asia and the Western Regions did have a certain influence on the Han Dynasty. The glazed pottery technique that suddenly appeared in the Western Han Dynasty may also have something to do with the ancient Egyptian glazed pottery technique. However, no matter where the craftsmanship of glazed pottery comes from, these two types of lead-glazed pottery represent the arts and crafts achievements of two ancient civilizations, and embody the outstanding wisdom of different civilizations.

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