



Analysis of Hu-Han War Portrait Bricks and Architectural Art Characteristics in Nanyang

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ABSTRACT

To dig deeper into the archaeological value of the Hu-Han War portrait bricks in Nanyang, this paper takes the Hu-Han War portrait bricks in Nanyang as the research object. It analyzes the hollowing, modelling and materials of the portrait bricks. Firstly, with the help of a portable high-definition microscope (Sanyo, Japan), the Hu-Han War portrait bricks' texture, direction and depth were analyzed. Then, with the help of the thin film pressure tester model 602 (Sanqiang, Guangdong), the bearing capacity of the portrait brick was tested. Finally, the artistic characteristics and stress of the portrait brick are summarized, and the architectural art characteristics are summarized. The results showed that the composition of the Nanyang Hu-Han War portrait bricks was kaolin, clay, etc., but the bricks had fewer voids and a compact texture. The direction of the hollow seal carving of the portrait brick is from both sides to the middle of the seal, and the depth of the seal carving is 1~2cm. The stress points of the portrait brick are the two sides and the centre, showing the characteristics of three points and one line. Therefore, the material of Nanyang Hu-Han War portrait bricks is tight, and the support points are reasonable, which can support modern architectural art.

Keywords: Nanyang, Hu-Han War, Portrait Bricks, Modern Architecture, Artistic Features.

INTRODUCTION

The Nanyang Hu-Han War was necessary in Chinese history and recorded an essential history of China (Bai, 2020). The portrait bricks of the Hu-Han War in Nanyang are mainly in the form of impressions, and some are in the form of seal carvings (Belardo, 2022). As a work of art with archaeological value, the portrait brick not only records the process of the Nanyang Hu-Han War and understands the historical background of the war but also has essential architectural value in the material, seal carving form and mechanical bearing point characteristics of the portrait brick. In the composition of the portrait bricks of the Hu-Han War (Chen, 2021), the Han army adopted the strategic steps of "killing the enemy in the front, advancing in the middle, and defending in the rear" to show the heroic and good fighting style of the Han army, and the invincible momentum and the joy of victory in the war. The length of the whole set of war portrait bricks is about 2m, the height is 30~40cm (Darma, Suciati, & Siahaan, 2022), and the way of printing is adopted, so the workmanship is very peculiar. It represents the art of blue brick casting and seal carving at that time (Darma, Suciati, & Siahaan, 2023). In the past, the research on the portrait bricks of the Hu-Han War in Nanyang mainly focused on the figures, shapes, lines, etc., and ignored the measurement and research on the portrait bricks' structure, seal carving and mechanical load-bearing aspects. To this end, this paper mainly conducts an in-depth analysis from several aspects; the main contents are as follows: 1) summarize and summarize the artistic value and hollow data of Nanyang Hu-Han War portrait bricks, and analyze the seal carving forms of character images (Darma, Suciati, & Siahaan, 2021), facial expressions and postures, as well as the materials of portrait bricks in combination with Han Dynasty painting techniques (Fang,

Xie, Zhang, Li, & Chen, 2023). 2) Use the microscope and thin film pressure testing instrument to test the texture and support force of the image brick. 3) Summarize the architectural value of Nanyang Hu-Han War portrait bricks, such as material, support, etc.

LITERATURE REVIEW

The Historical Background of the Nanyang Hu-Han War Portrait Bricks

Characteristics of the Hu-Han War Portrait Bricks in Nanyang

The Hu-Han War was a war between the Han and the Hu people in Nanyang during the Eastern Han Dynasty (25~120 AC), and it was a classic battle for the Han people to resist foreign invasions. In 1986, the Hu-Han war bricks unearthed in Nanyang recorded the Han army's heroic demeanour and the war's intensity (Gong & de Divitiis, 2023). However, the Nanyang Hu-Han War portrait brick has extremely high artistic value, representing the Eastern Han Dynasty blue brick's production process, the materials used, etc. (Guo, 2021). Therefore, the portrait bricks of the Hu-Han War in Nanyang have the artistic characteristics of heightening, mainly manifested as 1) artistic modelling and expression techniques made and expressed by ancient artists through ceramics. They are unique, showing the tense atmosphere of war and the emotional state of the characters through the expression of war scenes and characters' emotions. In creating modern architectural art, we can draw on this expression technique to express the theme and emotion conveyed by the architectural work by selecting and expressing artistic shapes. 2) Decorative style and aesthetic concept. The decorative style of Nanyang Hu Han Zhan's portrait brick includes decoration and pattern, etc., and the portrait brick has certain characteristics in the form and pattern selection (Hakem, Ali, Bárta, & Youssef, 2021). These decorative styles reflect the aesthetic ideas and artistic styles of ancient artists. In the creation of modern architectural art, we can learn from these decorative styles through the selection and application of forms and patterns, enrich the decorative effect of architectural works, and increase the visual art experience. 3) Historical and cultural connotation (Huo, 2020). The portrait bricks of the Hu-Han War in Nanyang mainly use green bricks as the drawing substrate, and the green bricks belong to ancient building materials. Their production processes differ in the Eastern Han Dynasty (25~220 AC) and the Western Han Dynasty (202 BC~8 AC). The portrait bricks of the Hu-Han War in Nanyang reflect the differences in building materials between the Eastern Han Dynasty and the Western Han Dynasty. They are of great value for studying and understanding the building technology, history and culture of the Han Dynasty. In the creation of modern architectural art, portrait bricks can provide support in terms of material selection and distribution of power support points, enriching the cultural connotation of modern architecture (Liu et al., 2022). In general, the architectural art characteristics of the Hu-Han War portrait bricks in Nanyang are obvious and have research value for the creation of modern architectural art, which not only provides a reference for the artistic modelling and decorative style of modern architectural art but also enriches the historical and cultural connotation of the building.

The Characteristics of the Structure and Material of the Hu-Han War Portraits in Nanyang

The materials of Nanyang Hu-Han War portrait bricks mainly include yellow clay, white clay, painted pigments, etc. Yellow and white clay are the primary materials of bricks, and they undergo special treatment and firing processes to make the bricks rugged and durable (Odrekhivskyi, 2021). Painted paints are used to paint patterns and figures on bricks, showing war scenes and heroic images through exquisite painting techniques. The architectural art characteristics of Nanyang Hu-Han War portrait bricks are mainly manifested in the following aspects (Fuentes Ortiz, 2020): First, the brick shape is unique, and the common different shapes, such as square, hexagonal and circle, through different combinations, have formed a rich and diverse decorative effect. Secondly, the painting technique is exquisite; the picture is delicate and vivid, which can accurately express the characteristics of the war scene and the image of the characters, giving people a strong visual impact. Third, the colors are rich and diverse, using bright color pigments such as red, yellow, and blue (Peng & Li, 2022) so that the brick surface is more vivid and full of artistic appeal. Finally, the decorative effect of bricks is outstanding, which can be flexibly combined according to the needs of the building to enhance its visual effect and artistic appeal. The architectural art of the late Eastern Han Dynasty (195~220 AC) focused on applying sculpture and painting and expressed themes and stories through decorative objects such as murals and portrait bricks. Modern architectural art uses more abstract forms, lines and colors to express artistic conception through the form and space of the building itself (Porter, Nordvik, Toolan, & Axelsson, 2021).

METHODOLOGY

This paper analyzed the texture, direction and depth of the Hu-Han War portrait bricks with the help of a

portable high-definition microscope (Sanyo, Japan). Then, with the help of the thin film pressure tester model 602 (Sanqiang, Guangdong), the bearing capacity of the portrait brick was tested. Finally, the artistic characteristics and stress of the portrait brick are summarized, and the architectural art characteristics are summarized. Among them, in order not to destroy the sample of the Nanyang Hu-Han War portrait brick, non-contact measurement is used.

DISCUSSION AND RESULTS

Composition Test of Han Dynasty Portrait Bricks

As an essential heritage of ancient Chinese architectural culture, the Hu-Han War portrait brick in Nanyang has rich artistic value and research significance. In the creation of modern architectural art, we can learn from the material of Nanyang Hu-Han War portrait bricks (Qin et al., 2020), and the traditional production method of blue bricks is integrated with modern concrete pouring to form a unique architectural structure. The microscopic measurements of the Han Dynasty portrait bricks are shown in Figure 1.

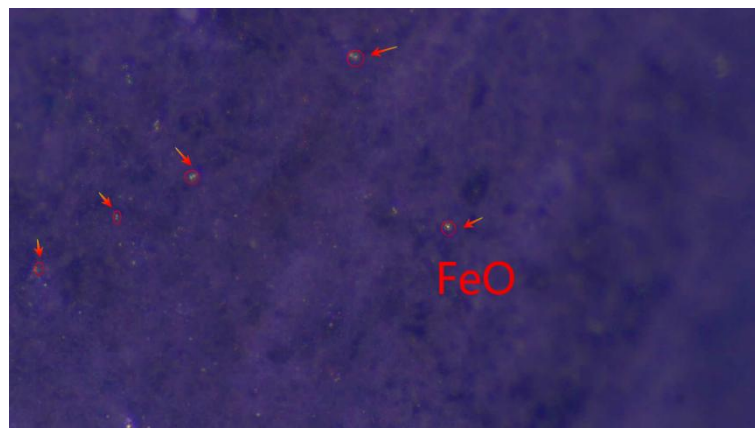


Figure 1. Observation of the Composition of the Hu-Han War Portrait Bricks in Nanyang

From the 4.5x high-definition microscope observation results in Figure 1, it can be found that the Nanyang Hu-Han War portrait bricks contain a large amount of ferrous oxide. It is mainly the upgrading of brick firing technology in the Eastern Han Dynasty (25~120 AC), from the red bricks in the Western Han Dynasty (202 BC~8 AC) to green bricks, and the method of closed calcination is adopted. The occurrence of a large number of FeO will increase the productivity and toughness of the green bricks, so the characters in the Nanyang Hu-Han War portrait bricks as lifelike, and the bricks are hard. Nanyang Hu-Han War portrait bricks comprise clay, lime, and mineral dyes to form a natural texture. Modern buildings use more modern materials such as reinforced concrete, glass, and metal and pursue the sense of science and technology and modernity of materials, as well as the production process of Nanyang Hu-Han War portrait bricks compared with the architectural forms of different materials, which are similar to cement paint, concrete moisturizing and other technologies in modern buildings so that building materials can be slowly solidified and enhance their acid resistance and oxidation resistance. Because the material of the Nanyang Hu-Han War portrait brick is challenging and keeps it for a long time, it has high artistic value and can leave traditional elements behind (Song et al., 2023).

Moreover, the acid resistance of the Nanyang Hu-Han War portrait bricks can enhance the characters' expression and the historical story of the Hu-Han War. Referencing traditional elements, borrowing colors and textures, expressing the story of the Hu-Han War, and referencing compositions and proportions for fusion effects. Due to its hard texture, the green brick structure is tight, and the patterns and carvings are exquisite, which can be used as a decorative element for the façade of modern buildings. A unique and historically significant architectural appearance is created through the redesign and creation of the motifs of people, chariots and horses in the portrait bricks of the Han Dynasty, and combined with modern architectural styles.

Tightness of the Material

Although the meaning of Nanyang Hu-Han War portrait brick has a large number of FeO elements, its primary material is kaolin, clay; the particle diameter of the material, particle void, will also have an impact on the solidity of Nanyang Hu-Han War portrait brick, so to observe the material tightness of Nanyang Hu-Han War portrait brick, the result is shown in Figure 2.

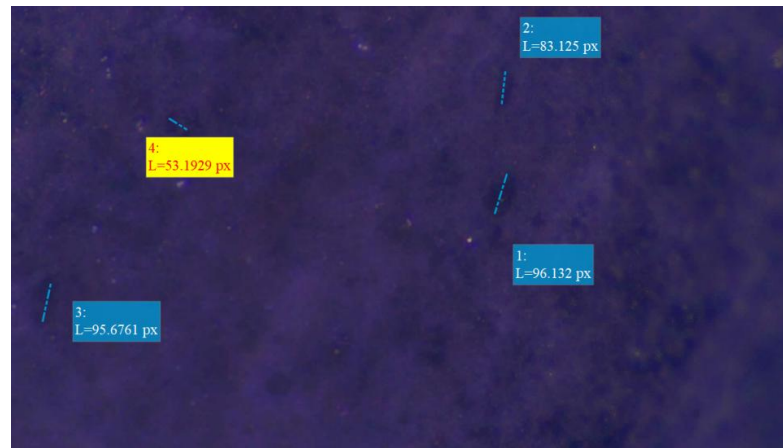


Figure 2. The Material of the Hu-Han War Portrait Brick in Nanyang

According to the microscopic observation results in Figure 2, the maximum particle diameter of the Hu-Han War painting brick is 0.96mm. The minimum diameter is 0.53mm, and the particles are uniform and compact. Moreover, there is no significant gap between the particles, and the tightness of the green brick is mainly increased by closed calcination. Due to the small diameter of the particles and the absence of gaps in the middle, they can be carved into complex and large-scale patterns, which can express the grandeur of the Hu-Han War. By the tight structure, the Han Dynasty portrait tiles are atmospheric and stable, and the texture is unique, which can be used to support the interior decoration of modern buildings. Material imitation to obtain better texture materials can add a simple and elegant atmosphere to the architectural design and enhance the overall artistic sense. Since there are no gaps between the materials, more patterns can be displayed, and historical elements can be integrated into the artistic creation of modern architecture. For example, in large-scale architectural projects, artwork with Han Dynasty portrait bricks can be placed on the façade of a building or public space to tell historical stories in the form of patterns and images, allowing people to appreciate the architecture while understanding its cultural connotation. In the late Eastern Han Dynasty (195~220 AC), the structure of the green bricks was changed, but the artistic characteristics were evident, and they could be applied to modern architectural art. First, regarding the design concept, the architecture of the late Eastern Han Dynasty (195~220 AC) focused on respecting tradition and monarchical authority and pursuing a solemn and stable appearance (Su, Ye, Liu, & Yu, 2023). Among them, the Hu-Han War painting Han Portrait Bricks focuses on practicality, functionality and innovation, emphasizing content expression and personality freedom, so it is more practical, providing a reference for modern architecture, presenting a variety of architectural forms, focusing on uniqueness and personality (Valdes-Socin, Daly, & Pétroussians, 2023).

Comparison of Seal Engraving Forms

The seal carving form of Hu-Han war portrait bricks is an essential feature in his art, which can provide a reference for modern architectural design. Using different forms of seal carving to create an architectural form with artistic beauty and visual impact enhances people's aesthetic experience of the building. The Hu-Han War painting Han portrait brick seal carving form is shown in Figure 3.

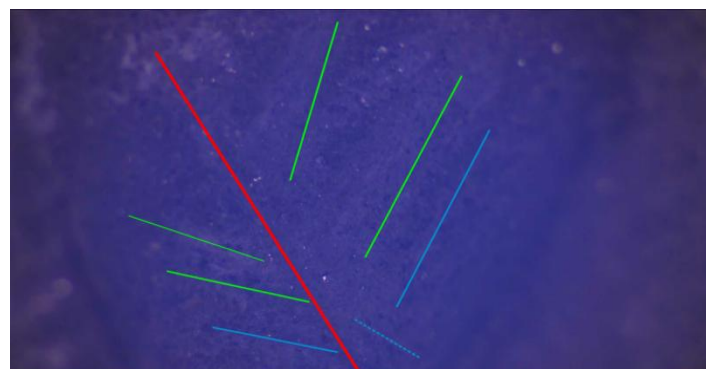


Figure 3. The Direction of the Seal Carving of the Hu-Han War Portrait Brick

Through the analysis of the seal carving direction of the Hu-Han War portrait brick, it can be seen that the

portrait brick mainly adopts the horizontal seal carving method, which has the characteristics of high seal carving accuracy and labour-saving. However, to better express the characteristics of chariots, horses, and figures, longitudinal, random, and mixed seal carvings are also used. However, longitudinal seal carving has higher requirements for strength, and the mixed seal carving method can improve the character's brilliance (Xia, Chen, Yang, & Wang, 2023). Therefore, the Hu-Han War portrait bricks mainly use mixed and random seal carving methods and less longitudinal seal carving methods. The pattern and seal carving methods in the Hu-Han War portrait bricks are counted, and the results are shown in Table 1.

Table 1. The Direction of the Hu-Han War Portrait Brick Seal Carving in Nanyang

Elements in the painting bricks	Seal carving direction			
	Transverse	Longitudinal	Mix	Random
Vehicle	√	√	√	√
National costume	√	-	√	√
Weapons	√	-	√	√
Horse	√	√	√	√
Scenery	√	√	√	√
Detail	√	-	√	-

It can be seen from Table 1 that the seal carving method used in the Hu-Han War portrait bricks in Nanyang is mainly horizontal, and there is less vertical use. Therefore, in modern architecture, it is necessary to use horizontal seal carving to express the shape as much as possible. Moreover, the shape expressed by the horizontal seal carving is more stable, the corrosion resistance is strong, and the corrosiveness of the shape is reduced. Through the analysis of the portrait bricks of the Hu-Han War in Nanyang, we can understand the form of seal carving, which can be used for the redesign and pattern engraving, colour, texture, composition and proportion of modern architecture, and can combine traditional culture with modern architecture to create unique and artistic value architectural works. This inheritance and recreation of ancient culture injects unique cultural connotations into modern architectural art.

Comparison of Supporting Forces

To study the rationality of the support of the Hu-Han War portrait brick in Nanyang, the supporting force is analyzed, and the results are shown in Figure 4.

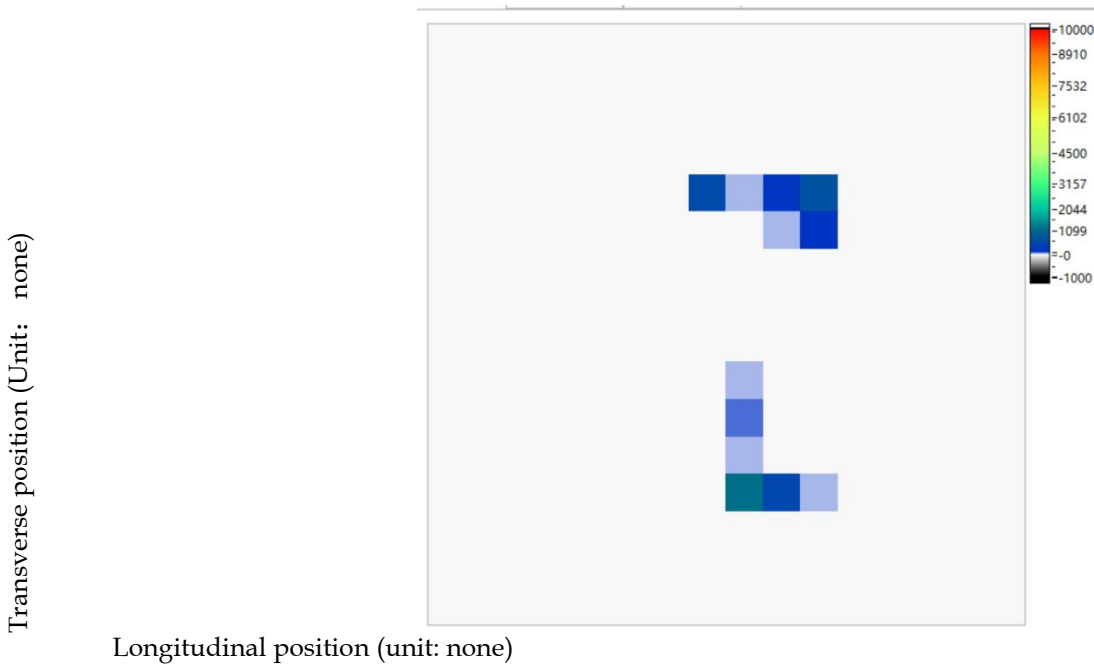


Figure 4. Analysis of the Hu-Han War Portrait Brick Supporting Force in Nanyang (Unit: G)

It can be seen from Figure 4 that the supporting force of the Hu-Han War portrait brick in Nanyang is mainly on the upper and lower sides, and the supporting force of the boundary point is 10.99g, and the middle is 8.52g. The pressure of the Hu-Han War portrait bricks in Nanyang is intermittently distributed, indicating that the design of the portrait bricks is supported by crossing. It can be seen that the production process of green bricks in

the Eastern Han Dynasty (25~120 AC) is excellent, and the overall structure of the portrait bricks is reasonable. Due to the reasonable support of the Nanyang Hu-Han War portrait bricks, in terms of architectural functions, the buildings of the late Eastern Han Dynasty were mainly used for specific purposes, such as palaces, mausoleums, and temples, emphasizing the adaptability to specific scenes and functions. Modern architectures focus more on versatility, flexibility, and sustainability to meet different needs and usage patterns. To sum up, the Eastern Han Dynasty (25~120 AC) has significant advantages in terms of supporting force (Yin, Chen, Zhao, Li, & Zhang, 2020), production technology and material, which can provide support for modern architectural art. The two can also learn from each other and integrate. In modern architectural design, by absorbing the cultural connotation and craftsmanship of blue bricks in the Eastern Han Dynasty (25~120 AC), combined with the innovative concepts and technical means of modern architecture, we can create unique and culturally rich modern architectural works (Yue, Zhu, Song, & Tang, 2021). This cross-era integration enriches modern architecture's artistic expression and helps to inherit and promote traditional culture.

The Influence of the Artistic Value of the Nanyang Hu-Han War Portrait Brick Building

The Application of Nanyang Hu-Han War Portrait Bricks in Modern Architectural Art

Nanyang Hu-Han War portrait brick has been widely used in modern architectural art as a building decoration material with unique artistic value. It can not only be used to decorate traditional buildings, such as palaces, mausoleums, etc., but also plays an essential decorative role in modern architecture. For example, in modern villas, public buildings and cultural places, Nanyang Hu-Han War portrait bricks can create a unique artistic atmosphere and add historical and cultural connotations to buildings. The specific application effect is shown in Table 2.

Table 2. Application Range of Han Portrait Bricks in Nanyang

Type of building	Color	Material	Content
Entertainment	√	√	√
Villa	√	-	√
Public buildings	√	√	
Cultural venues	√	√	√

From the use of the portraits of the Han nationality in Nanyang in Table 2, it can be seen that the colour, structure, content and regional culture of the portraits of the Han nationality have a high utilization rate in the creation of modern architectural art, which is in line with the aesthetics of modern people.

The Inspiration for Nanyang Hu-Han War Portrait Bricks to the Creation of Modern Architectural Art

The architectural characteristics of Nanyang Hu-Han War portrait bricks have important enlightenment significance for the creation of modern architectural art. First, its unique modelling and painting techniques remind us to pay attention to details and artistic expression in modern architectural design and create a unique architectural style through clever combinations and innovative design techniques. Secondly, the use of color in the portrait bricks of the Nanyang Hu Han Zhan inspired us to use color in modern architecture. Color is an essential means of expression in architectural art, and the rational use of color can bring vitality and charm to the building so that people and the building have resonance and emotional resonance. Finally, the decorative effect of the Nanyang Hu-Han War portrait bricks reminds us to pay attention to the integration of architecture and environment in the creation of modern architecture. The building complements the surrounding environment through appropriate decorative materials and decoration methods. It presents a harmonious and unified overall effect to verify the artistic synthesis of the different architectural style categories, shown in Table 3.

Table 3. The Overall Contents of Different Buildings

Building category	Artistic indicators	Seal cutting	Material	Cultural connotation
Antique architecture	Sculpt	√	√	√
	Skill	√	√	√
	Artistic expression	√	√	√
	Color	√	√	-
	Material	√	√	√
	Lines	√	√	√
Modern architecture	Sculpt	√	√	√
	Skill	√	√	√
	Artistic expression	-	-	√

Building category	Artistic indicators	Seal cutting	Material	Cultural connotation
	Color	√	√	-
	Material	√	√	√
	Lines	√	√	√
Complex construction	Sculpt	√	-	√
	Skill	√	-	√
	Artistic expression	-	√	√
	Color	-	-	-
	Material	-	-	√
	Lines	√	-	√

The results in Table 3 show that the materials of the Nanyang Hu-Han War portrait bricks are mainly composed of clay, lime, and mineral pigments, and the production process is mainly ceramic production and painting techniques (Zhan, 2021). Secondly, the artistic modelling characteristics of the Nanyang Hu-Han War portrait bricks are mainly manifested in the character image, action expression, posture and decorative style, which reflects the cultural aesthetic concept of the time (Zhang et al., 2022). Finally, we can see its significant influence on the creation of modern architectural art. It provides unique decorative materials and rich artistic expressions for modern architectural art creation. Therefore, it is necessary to fully explore and utilize the artistic value of Nanyang Hu-Han War portrait bricks, apply them to the creation of modern architecture, enrich the artistic connotation of architecture, and enhance the aesthetic value of architecture (Zhao et al., 2023).

CONCLUSION

As an important historical relic, the portrait brick of the Nanyang Hu Han Zhan reflects the ease of making the Han Dynasty's blue bricks and the painting skills and ability at that time. Hence, the study of the painted brick has crucial archaeological value. In this paper, the portrait bricks of Hu Han Zhan in Nanyang were tested with the help of microscopes and thin film strength testers, and their materials, textures, structures, and supporting forces were studied. The results showed that the Nanyang Hu Han Zhan portrait brick used clay and kaolin as raw materials, and the closed calcination method was used to increase the strength and acid resistance of the brick. Moreover, the seal carving method of the Nanyang Hu Han Zhan portrait brick is mainly horizontal, supplemented by random and mixed seal carving, and there are fewer ways of vertical seal carving. Hence, the realism of the portrait is better. Regarding the support force test, the supporting force of the Nanyang Hu Han Zhan portrait brick is mainly on both sides; the middle support force is less. The support force is intermittently distributed, which indicates that the Nanyang Hu Han Zhan portrait brick minimizes the weight and reasonably distributes the support points. Therefore, the measurement results of the shape, material and seal carving method of the Nanyang Hu Han Zhan portrait bricks and the supporting force provide support and reference for modern decoration.

AUTHOR CONTRIBUTIONS

All the authors contribute equally in the manuscript.

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CONFLICT OF INTEREST

There is no potential conflict of interest was reported by the authors.

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