

SAGAR BOXES AND THEIR USE: ON THEIR PAST AND PRESENT

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Abstract

Sagar firing technique first emerged in China, during the Sai and Tang periods, as closed boxes, used for firing in the kiln. The purpose of these boxes during that period is to protect the contents from flame, ash, smoke and other materials in the kiln. Chinese ceramics craftsmen could fire high quality porcelains in a clean way and without being reduced to waste. Even, with the help of these boxes, they could produce celadons that attract high appreciation all over the world and especially in Europe. Ceramics craftsmen, who kept the Industrial Revolution alive in the heart of England, used this firing technique that they learned from the Chinese craftsmen. This technique was quite essential especially for their kiln that is heated via coal.

These boxes are still use with the same purpose in today's modern ceramic industry and art. Yet, when it comes to the 20th century, ceramic artists used sagar boxes outside their purpose, even with a contrary practice. The purpose of the 20th century ceramic artists is to achieve decorative lines, colors and effects on the surface of the ceramics. In order to fulfill this aim, along with the product to be fired, metal oxides, salts, sulfates and other combustible materials that provide a reductive atmosphere are put in the sagar boxes. In short, these boxes are used in firing contrary to invention and utilization of the Chinese. Through the use of such firing technique, colorful, vibrant and surprising surfaces could be obtained in the artistic sense.

The objective of this study is to reveal the brief history of sagar boxes, traced from the past until recent times, and to exhibit their contrary use with contemporary examples.

Keywords Ceramic, Firing, Sagar, Reduction, Art

INTRODUCTION

Humans, experiencing that they can shape clay, which is the raw material of ceramics, when they mix it with water, discovered that clay hardens with fire, becoming even more durable. However, they fired their ceramic urns directly in fire. Naturally, most ceramic urns that came into direct contact with fire were harmed. Similar to other fields, ceramics developed through experimentation and aesthetic concerns. Thus, ceramics firing methods improved, varied in time and developed based on the era, geography and the product and became a preference. Ceramics masters, observing that directly fired ceramics were harmed, tried to resolve that problem and discovered the boxes, which were called saggar.

Saggar boxes are boxes that are resistant to high temperatures and produced to protect ceramic

products from flames, fumes, ash and undesired effects that occur in the kiln. As a result of inflammable materials deposited in these boxes, a reductive atmosphere was obtained in the kiln and thanks to this atmosphere the chemical structures of both the glaze and the clay are altered, producing different colors and effects.

A firing technique in which the kiln is denied oxygen in order to coax different colors and textures from clay, oxides and glazes. This is the opposite of oxidation firing in which additional oxygen is introduced during the firing cycle (C. Garth, p. 232).

The History of Aggar Boxes

The boxes are known to be used initially during the Sui and Tang Dynasties in China to fire ceramics, porcelains, and especially celadons produced for sovereign families. “Conventionally saggars are used to protect products from ashes and residues, direct effects of the flames when firing with wood and coal” (D. Sumi, 2001, p.56). Forms of saggarr boxes could change based on the product that would be fired, but they should be designed for resistance to high temperatures, durable for repeated use and stackable in the kiln next to and on top of each other. Saggarr boxes enable clean products by balancing the atmosphere in the box and by protecting the ceramics from direct fire. Thus, they have quite a practical use in kilns heated by wood, coal, fuel oil or other sources. Saggarr boxes initially used to fire celadons in China in history, later became prevalent in northern Europe, especially in Staffordshire, England, where mostly coal kilns were used. British ceramics

masters, who learned the technique while importing celadon from China, took their place in English kilns starting from the 15th Century.

The first potters who fired with saggarr boxes discovered that evaporating glaze created a glass-like substance on the internal surfaces of saggars. The transfer occurs via evaporation, which happens by the return of the fume onto the product when it hits the coated inner surface of the saggarr. As a result, investigating potters started to use this reaction to gain novel advantages (D. Sumi, 2001, p.144). Hence, the perspectives of modern ceramics artists towards saggarr use improved.

Saggarr boxes are used in a quite opposite manner in modern ceramics art. While in the past these boxes were used to protect the product from the unbalanced atmosphere of the kiln, flames and ashes, in the modern sense they are used to expose the product to ashes, salt, metallic salts and oxides under reductive atmosphere, completely in an opposite manner.



*Figure 1: Saggarr boxes, Shanghai museum, China.
<http://www.carolventura.com/Jingdezhen.htm>*

Modern Use of the Saggar Boxes

In modernity, the firing technique that took its name from saggar (protective) boxes that are used to create a reductive environment in electric or gas powered kilns is one of the alternative firing techniques. The most important characteristic of this technique that separates it from others is firing of ceramic pieces in different compartments within the kiln after biscuit firing. The main principle of the technique is to expose ceramic piece in biscuit condition to sawdust, oxide, dried leaves, salt and other materials in the box to improve the effects of organic and inorganic substances on the ceramic product and protection of the kiln from Saggar boxes used in saggar firing used by modern ceramics artists frequently as an alternative and experimental method, albeit being an auxiliary material, are the most significant detail in firing. Whether they are used in older kilns heated by wood or coal, or in modern kilns with gas or electricity, the saggar boxes should have certain features. Primarily, they should be resistant to thermal shocks and high temperatures and they must have a tight lid. A box with these features could be used for firing many times continuously, but naturally they have a functional life. Formation of saggar boxes took a long time and effort, similar to the ceramic or porcelain pieces that would be put inside. They could be shaped based on the needs. Modern ceramic artists could produce saggar boxes based on the ceramic form that they would create or tailor-made using appropriate shaping method.

“The role of oxygen on ceramic raw materials is significant in the firing phase. Clay and glaze undergo certain changes under high temperatures in the kiln. As the compounds resolve, gas is released. In the meantime, certain chemicals dissolve and either harden the product during cooling or form new compounds. All these changes are constant stages in firing based on factors such as the composition of the body, the temperatures reached during firing and firing rate. The quality of the kiln atmosphere determines the target color, porosity, and desired electrical or mechanical properties based on the type of the product that would be fired. Kiln atmosphere changes based on the rate of the oxygen in the environment such as reductive, oxidated and neutral. The atmosphere with reduced oxygen intake is reductive. Experiments conducted based on aesthetic purposes demonstrated unique textures and colors as

a result of this firing technique” (O. C. Feyza (2005), p.122/123).



Figure2:Saggar maker
(<http://www.thepotteries.org/jobs/saggar.htm>)



Figure 3: Saggarboxes, which use in Staffordshire
(<http://www.carolventura.com/Jingdezhen.htm>)

This firing technique that is completely open to experimental studies and preferred by contemporary artists, sawdust, salts, metallic salts, oxides, copper and aluminum wires are used in previously prepared and fired saggar boxes. The artist, who is open to experimentation and surprise results, would find her

or his own method and use it. In each experimentation, different and unique effects are observed. These surprise results make this method exciting and repeatable continuously. Copper and aluminum wires closely enlaced around biscuit fired ceramic products would produce different color spectra from orange to black. Sawdust placed in the box is necessary for a sooty character and a reductive atmosphere.

Shapes of contemporary saggar boxes and use of inflammables could differ based on the preferences and previous experiences of the artist.

The saggar firing is more successful if saggars are similar to the size and shape of your pot. A tall vase will require two elongated bowl shapes, or one very tall saggar with a shallow bowl lid. A small round pot needs a smaller round saggar. For the best results, allow at least an inch of air space between your saggar wall and the sides of your pot. The amount of air space on the top of the saggar is not as critical, and variations in space provide variations in your finished pot (R. Linda–Charlie, p.108).

During application, copper or aluminum wires could be wrapped around biscuit fired ceramic forms within biscuit fired saggar boxes. Or, long pieces of cloth soaked in colorizing oxides could be wrapped. On the box floor, 5-6 cm thick fine sawdust, surface or metallic salts and carbonates could be placed. After the lid is closed tightly, the saggar box could be fired under 900 – 1000°C. In this firing method the kiln temperature should be kept low, because in temperatures higher than 1000°C, colors and transitions lose their effects. As mentioned above, during application and firing stages, the steps are purely based on the choice of the artist.

Contemporary ceramics artists developed saggar firing with different experiments and created their own techniques. For instance, instead of using a saggar box, they could simply wrap the product with aluminum foil and still succeed. Aluminum folio use, similar to saggar boxes, keeps the fumes and vapor within the folio, providing reductive atmosphere and protecting the kiln at the same time.

Saggar use continues today both with traditional methods and contemporary methods, which are individual discoveries of the artist.

CONCLUSION

Saggar firing technique is an alternative firing method that provides unique effects for the artist without the use of glaze. Sagger boxes that the technique was named after are refractor boxes used since the times of old Chinese dynasties. Back in their day, they were used to protect ceramic, porcelain and celadon urns from the kiln atmosphere, but today they are used for completely opposite purposes. This contradiction was the basis of the present study.

Saggar boxes, which were prominent in the old ceramics industry, shaped around the desires of the artist today and used based on experimentation with several material utilized in firing.

As a result of applications, different effects, exciting expectations occurred in every firing. It is obvious that this technique would meet different artists in the following centuries and will be shaped in their hands to produce exiting results over and over again

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