(Terracotta cup, n.d.)

DECORATIVE STYLES OF ROMAN SAMIAN WARE

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Contents

Introduction

Samian and Arretine are one of the most well-known styles of Roman pottery. Its glossy red-orange exterior not only highlights the designs on the pieces but also acts as a barrier between the vessel and items they hold. The importance of this ware in Roman culture is such that Pliny mentioned it directly in his *Natural History*:

> "For the service of the table, the Samian pottery is even yet held in high esteem; that, too, of Arretium in Italy, still maintains its high character; while for their cups, and for those only, the manufactories of Surrentum, Asta, Pollentia, Saguntum in Spain, and Pergamus in Asia,431 are greatly esteemed.... These works of artistic merit have conferred celebrity on some cities even, Rhegium for example, and Cumæ. The priests of the Mother of the gods, known as the Galli, deprive themselves of their virility with a piece of Samian" (Elder)

These wares are known generally by several names, including Roman red-gloss pottery, terra sigillata ware, redware, and red glazed ware. They can be further broken down by region to either Arretine ware (those being made near modern day Arrezzo in Northern Italy) or Samian ware (those being made in the Gaulish region of modern-day France and Germany) (Johns, 1971).

These red ware items were made with fine red earthenware clay (the finer the clay, the higher the quality) coated in a fine slip (terra sigillata) and fired to produce a shiny or buttery-appearing gloss on the final piece. This style of pottery was used throughout the areas of Roman influence from the first through the early fourth century.

Vessels in this decorative style were made in a variety of shapes including cups, vases, bowls, and dishes. Vessels were considered valuable ware, and these decorative items were reserved primarily for serving instead of preparing items.

This decorative technique with its controlled firing, slip application, and burnishing has items in common with previously existing pottery, including those from Greek and Minoan cultures. Mold relief decorations can likely be attributed to relief metal vessels which were prevalent in the Roman empire at the time (Johns, 1971), and the technique for making these molds for pottery can be found in Greek vessels of Megara or Samos from the third and second century BCE (Yoanna Leon, 2014).

With the expansion of Roman influence, pottery centers expanded as well, including locations in modern Ireland, the United Kingdom, and into Western Russia. Due to resources, clay type and quality, and regional decorative tastes, unique designs and decorative techniques were developed in these regions (Peacock, 1982). This project's focus is that of the common decorative techniques (unadorned, incised, barbotine, applied, relief-molded) used throughout Roman Gaul from the first to the fourth century.

Roman Gaul

Roman Gaul at the end of the Roman expansion encompassed modern day France and parts of Netherlands, Belgium and Germany. Following the end of the Second Punic War, Rome took control of formerly Carthaginian territories in Spain, which grew the empire westward, but presented a problem, as the province of Gaul separated these new territories from Italy. Rome then began creating founding colonies and outposts through southern Gaul to connect Rome to its new territories in Spain.

Figure 1Roman Gaul (Britannica, 2024)

By 122 BCE Roman had defeated the Allobroges and Arverni tribes in southern Gaul and was able to establish the Via Domitia Road linking Italy to Spain through Gaul. By 121 BCE the southern region of Gaul was formally annexed as a Roman Province, and the capital of Narbonne in modern day southern France was founded.

Expansion into the northern and then eastern regions of Gaul continued culminating in the Gallic wars from 58-50 BCE resulting in expansion of Roman over whole area of Gaul (Gregg, 2024).

As with many Roman providences, several main roads and trade routes over land as well as sea provided transportation for the pottery out of this region throughout the Roman empire. There is not a lot of written evidence on how this pottery was distributed, the bulk of the pottery found along the routes seem to indicate the long-distance distribution of pottery was done by wholesale merchants which delt in several types of goods. Whatever the method the distribution of these wares reached most areas of Roman influence with pieces being found in digs in Pompeii, Britian, Spain, North Africa, and into Russia (Pena, 2007) (Peacock, 1982).

Roman Gaul Pottery Shop

From bricks used to build the Roman roads, to the vessels used for cooking, serving, and transporting goods, pottery played a major role in Rome and its people's daily life. Roman military units moving into these regions included many skilled artisans in their ranks to supply needed items, such as bricks and roof tiles, and, as needed, ceramic pots (Green, 1992).

Military production often did not continue; once regions stabilized; inhabitants soon followed military units and artisans moved into the region, taking over pottery production sites or creating workshops of their own.

While several Roman pottery sites have been excavated in Gaul, there is little written record as to how the pottery was produced or the size of the shops and the division of labor. The footprint of these workshops indicate they were smaller than those in Italy. The large number of vessels produced indicates workshops with several individuals completing different tasks, instead of individual potters.

This division of labor is supported by the existence of names stamps on the various parts of the pottery. These name-stamps often are accompanied by the letters F, FE, or FEC indicating 'made ~~it~~ by' or M or MA indicated "by the hand of" indicating the pot finisher, or OF signifying officina or workshop. If a mold was used, the mold maker's name can be found written on the bottom of the pot in reverse (Green, 1992) (Johns, 1971). They have also been found in Sagalassos workshops with the remains of several wheel pits in a single room placed parallel to each other, suggesting parallel workspaces (Poblome, 2012).

The multi-phase process of making pottery also lends credit to the idea of multi-person shops with each having a specialty. This assembly type of process would allow for multiple pieces to be worked on at once resulting in a larger output. While working through the process of decorating these pieces for this project, it was clear that there were several decorative techniques which would lend themselves to this type of approach, especially in relief molds.

In the case of the relief mold process, I set up several stations for each phase of the creation and moved between stations to create one pot and found that I was able to produce a bowl from preparation to final throwing in a matter of minutes (approximately seven) with the longest time encompassing moving between the stations. As I continue to practice this technique, I believe I could improve upon this time limiting production only to the availability of resources and the molds.

Clay

In the creation of Roman Samian ware, the quality of the clay played a large role in the ability to create the fine wares. Clay needed to produce Samian ware needed to be of high quality, limiting the locations of workshops (officinae). The clay supply was likely near or within a short distance from various workshops to limit the cost and effort of transportation. Based upon excavations and findings near kilns and workshops it is likely that clay was dug out of pits in quarries instead of underground (Peacock, 1982). Clay would have been then strained to remove debris and then worked (wedged) until smooth, adding additional elements such as sand as needed to provide the correct consistency.

Clay used by the Romans is of the type called earthenware. Earthenware clay is a non-vitreous clay that is fired below 1,200 C. Even when fired, this clay will absorb and leak liquids and requires a coating, such as glaze or a slip to make less porous. At the time, technology did not exist in Europe to fire clay to a higher temperature, so all clay was of the earthenware variety, allowing it to be fired

in pits, or updraft kilns. The composition of several of the examined pieces of clay vessels from Gaul where these wares were produced, were primarily found to be non-calcareous (comprised of alumina, and iron oxide) (Yoanna Leon, 2014). High levels of iron oxide in the clay produce a red base piece for the rich terra sigillata slip which is applied over the top.

These clay restrictions determined the location of workshops in the region to several clustered areas. In southern Gaul wares were produced at La Graufesenque, Montans, and Banassac Millau in modern day southern France. With expansion into central Gaul, workshops developed in the valley of Allier, Les Martres de Veyre, and Lezoux. Further expansion developed workshops in Eastern Gaul containing far reaching sites including those on the upper Rhine.

For this process, I used red art terracotta clay (CAC LOWFIRE CLAY – RED ART TERRACOTTA, n.d.). This clay body was chosen after discussions with the individuals at this store for its red color as well as smooth texture and particles which form a tight body. For the clay used in throwing the pieces I used 'wet' clay which is prepared and is ready to throw at the time of purchasing, with only additional wedging needed.

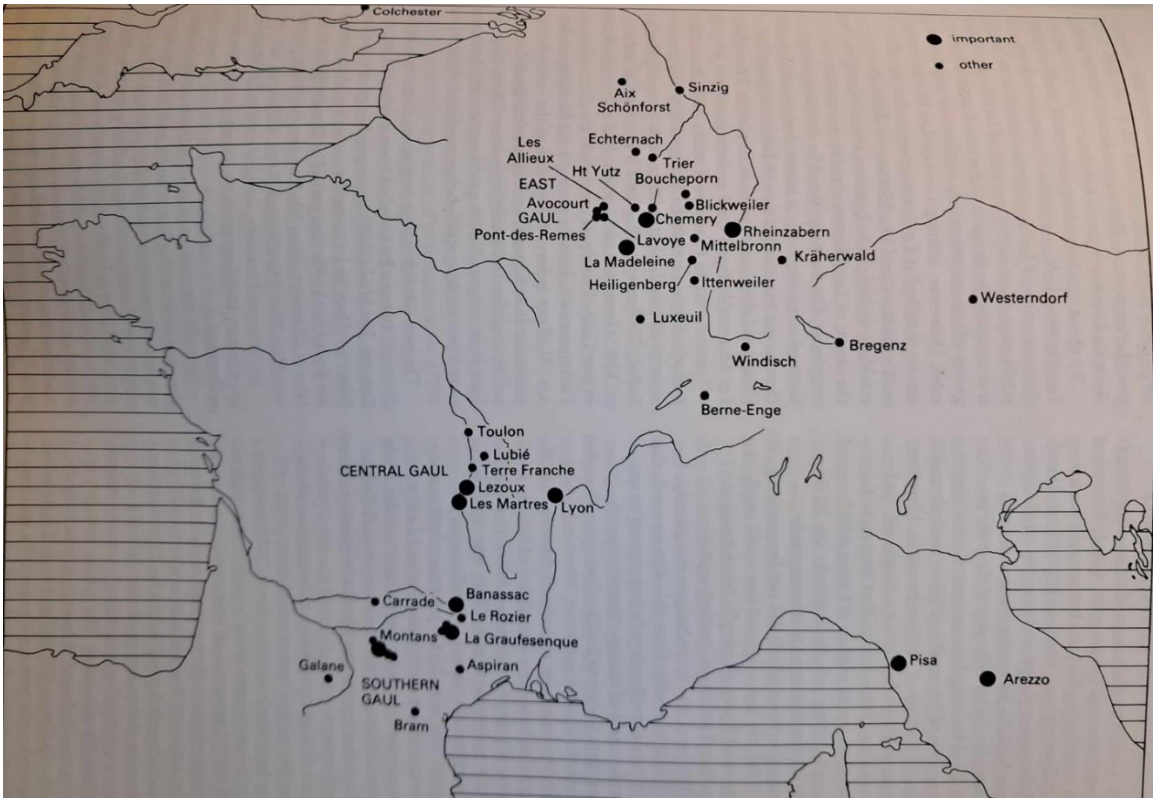


Figure 3 Production centers for Arretine and Samian pottery (Peacock, 1982)

Terra Sigillata Slip

Terra sigillata is not a glaze, but instead a slip: a thin solution of clay which is applied to pottery prior to the initial firing. The very particles of the clay used for the slip are required not only to be fine in nature but have a plate alignment resulting in the best gloss. Both features are found in

Illate-based clay, and examination of Terra sigillata supports the use of an Illate -based clay (Piero Mirti, 1999) (Johns, 1971).

When examining sigillata slips using X-ray diffraction and Raman spectroscopy, slip used in pieces from both Italy and Gaul were found to be characterized by a high rates of iron, aluminum oxide, potassium, and silicon dioxide[1] (Yoanna Leon, 2014) (Piero Mirti, 1999). This rich Iron serves to impart the red-orange color while potassium serves as the catalyst for creating terra sigillata.

Terra sigillata is created by mixing fine clay, water, and a deflocculant and letting the mixture set (in the case of my experiments and research one day). Until the mixture separates and the coarser particles fall to the bottom and the finer particles stay suspended, forming the slip.

The deflocculant is a key item in creation of the slip. Deflocculants are agents which can be added to particles in suspension, pushing them apart. Some of the most common deflocculants are sodium, potassium, chlorides, and carbonites. Plant ash is high in potassium and sodium carbonate and was likely used as a deflocculant in preparing the slip. Which plant was used may have varied by site and availability, and could have included Kelp/seaweed, or other ash left over from burning materials in the kiln. While these deflocculants could have been made onsite, they could also have been bought or transported to the various sites (Taylor G.).

For this process I created my own terra sigillata slip using red art terracotta dried clay from Clay Art Center (CAC LOWFIRE DRY CLAY – RED ART TERRACOTTA, n.d.), water, and soda ash as the deflocculant. The process for the creation of terra sigillata slip can be found in Appendix C.

Roman Pottery Hand Tools

Hand tools are a classification of tools which are held in the hand and used to build, shape, and decorate pottery pieces. These tools can be associated with the creation of shapes created on a wheel, constructed by hand, or a combination of both.

Identification of pottery tools can be difficult, due to materials the tools are made of, as well as a pattern of reuse and adaptation of other objects not typically associated with pottery production (Poblome, 2012). There are no written accounts that have been found that clearly document hand tools used by Roman Potters.

There have been several excavations of Roman pottery shops in various regions which have provided a view on items that are likely to be used based upon the number of items of types and similarities found. Many of the items are like modern-day hand tools and for this purpose I will use the modern name.

Examining these tools, it can be noted that many of these objects could have been re-purposed from already existing items or made within the workshop itself. Potter's ribs, stamps, and excavated molds have been found to be made of the same clay as the wares produced from the workshop (Poblome, 2012). This would have allowed a potter to make tools specifically to meet

[1] Appendix B

their needs. It is also likely that, as today, these ancient potters re-used various items such as sticks, shells, and other textured items which could be found around them for their purposes.

I recreated tools according to findings and experimentation of experts in the field, including Graham Tayler. Excavated examples and recreated counterparts I made and used are outlined in Appendix A.

Roman Pottery Wheels

A pottery wheel consists of a wheel head of material placed on top of a pivot point or shaft. The clay is then affixed to the wheel head which is then turned. The clay is moved while the wheel is turning allowing for quick manipulation of the clay. With practice and preparation uniformly, which would have been important for stacking goods inside a kiln.

Figure 4 Mural of master Potter at wheel Pompeii (II.3.9 Pompeii, Pottery and garden. Linked to 11.3.7 and II3.8, n.d.)

Due to the large number and shapes of the vessels as well as evidence such as finger marks and the direction of the clay platelets, there is no doubt that the bulk of Roman pottery was produced on a fast wheel.

Based upon findings of pieces of wheels as well as images from various structures the types of wheels which would likely have been used by Romans potters were foot/kick wheels (BETTLES, 2011), hand wheels, or stick wheels.

Figure 5 Foot/Kick wheel from painting Divine potters Ptah and Khunm-re at Kellis (BETTLES, 2011)

Figure 6 Replica Roman Stick Wheel (Taylor G. , Post Roman Pottery Why the wheels fell off, 2021)

For the recreation of pieces for this process, an electric wheel was used for space consideration and availability. These wheels, while operated by electricity, work of the same principle as historic wheels consisting of a moving head which clay is worked on; the main difference is that these wheels are powered by electricity instead of the hand, foot, or stick.

Roman Samian Kiln

Roman kilns are updraft kilns comprised of a lower chamber filled with combustible material and an upper firing chamber where the pottery was placed. Heat rose from the combustible materials up to the opening in the top of the kiln. These kilns were constructed with bricks, mud and sod, stone, previously fired clay, and other natural heat-resistant elements.

To maintain the signature red-orange color of these pieces, the oxidation in the kiln had to be carefully maintained. Any exposure to smoke would cause pieces to turn grey or black, and thus a new type of kiln had to be created to exclude smoke while still allowing heat to move through the kiln and reaching the 1,000 C to 1,100 C equivalent to cone 05.5 to cone 01 (Yoanna Leon, 2014) temperatures needed to mature the clay and produce the glossy look.

Specialty kilns were developed containing pipes between the combustion chamber below and the roof to draw the smoke up and away from the pottery while still heating the pottery. The diameter of the pipes in the different parts of the kiln would vary to allow controlling of the temperature in the various sections of the kiln (smaller in the middle and larger by the walls). While the kiln sizes and shapes would vary, these pipes proved key to firing wares at a consistent and high rate (Çizer).

The process to fire a terra sigillata kiln required many hours with constant monitoring of the temperature by observing pieces likely through a looking hole or the top and a large quantity of combustible materials being feed at specific times to ensure the temperatures were raised at a certain rate and the temperatures reached a high enough temperature to set the slip and provide the glossy look and water impermeability while not reaching temperatures too high that the glossy look burned off, leaving pieces looking dull (Yoanna Leon, 2014).

Excavation of kiln sites, as well as their relation to several known workshops, indicate that while larger shops may have had labor and supplies to support their own kiln, it is likely that many workshops would have shared kilns to offset the cost and labor. Sharing of a kiln would also allow for its space to be filled quicker, due to output of various workshops allowing for the kilns to be fired more frequently (Taylor G.).

Figure 7 Kiln in La Graufesenque (Çizer)

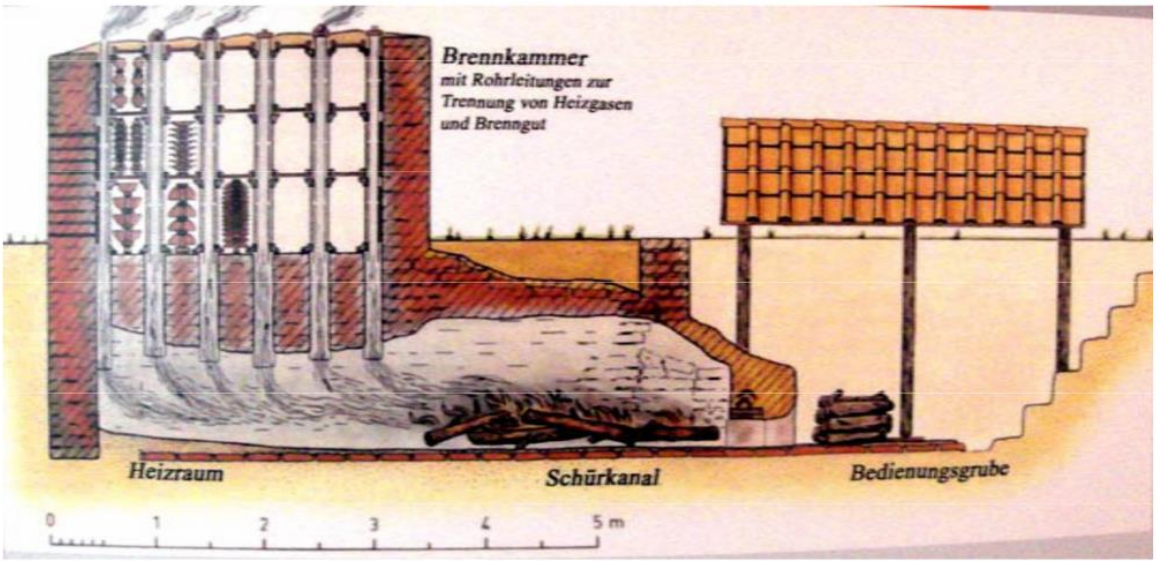


Figure 8 Terra Sigillata Kiln in Reinzabern, Germany

Figure 9 Roman Kiln Pipes and shelves (Terra Sigillata Museum, n.d.)

Due to regulations in my community, as well as complexity and size limitations, I was not able to build a kiln of this style for this project, and a pit kiln or other combustion kiln would have produced smoke, marking the color. Instead, I used an electric kiln which I heated to between 1,000 C to 1,100 C at each run.

Decorative Techniques

Decorative techniques fall into four main groups: incised/cut-glass, barbotine/slip-trailing, applied/appliqué, and relief-molded (Peacock, 1982) (Johns, 1971). One could argue that the simple application of terra sigillata slip without further decorations could be a technique, but as it does not employ any additional steps then all other techniques are found below, I have chosen not to call this out specifically as its own technique.

Incised

Figure 10 Example of Incised decoration (Museum, n.d.)

Incised decoration techniques are also called cut-glass, as this technique resembles cut glass vessels of the same period. It generally consists of star or leaf patterns cut out of the vessel before firing when the clay is partially dry (known as leather hard). These cuts are often made with U or V-shaped tools to produce the distinctive shape.

Process steps

To create this decorative technique, I followed steps:

Step 1

The shape to be decorated was thrown on a wheel with earthenware clay. I chose to use a vase shape as most of the surviving pieces with this decorative style are categorized as vases (Johns, 1971). While throwing, I gave extra care to smooth the surface to allow for better alignment of the particles of the Terra sigillate resulting in a smoother buttery surface.

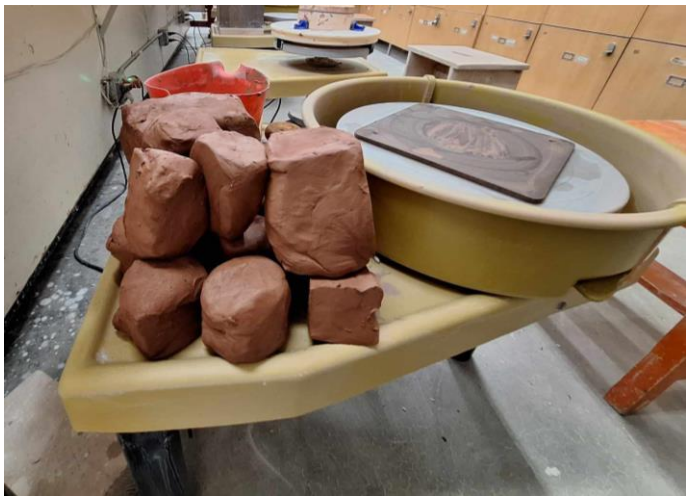


Figure 11 Clay prepared and ready to throw on electric wheel.

Step 2

The piece was left to dry until slightly hard and handles were applied to the vase.

Figure 12 Surface prepared to apply handle.

The piece was then left to dry slowly to a point where it will not leave a mark when touched, but not yet to dry so that it has started to change color. This is usually referred to as “leather hard”.

Step 3

The now partially dried piece was trimmed (excess clay removed from the base of the piece) and further smoothed by ‘burnishing’ the piece using a smooth piece of bone, stone, or even leather. This process not only serves to provide a visibly smooth surface but serves to mechanically orient the plate like clay particles, so they lie parallel to the surface reflecting the light. This step is optional, but I found it did make a slight difference in the overall look of the pieces and accomplished with a piece of softened leather.

Figure 13 Example of burnishing clay with leather.

Step 4

With the piece prepared, the design was cut into the surface using a sharpened tool. For this piece I further stamped with a shell stamp to add to the design. The combination of different design elements could often be found on vessels to create a desired look.

Figure 14 Piece burnished and ready to apply decoration

Figure 15 Design being incised with sharpened wooden tool.

Figure 16 Line being incised with metal rib

Figure 17 Separator line added to design using shell-based stamp

Step 4

The piece was now left to dry fully. To minimize stress on the piece while drying, the piece was partially covered and left to dry out of direct light and airflow. Once it was fully dry terra sigillata slip was applied, as outlined in the section below.

Figure 18 Finished process piece

Barbotine

Figure 19 Example of Barbotine decoration (Terracotta dish with barbotine decoration, n.d.)

Barbotine or slip-trailing decorative method was a very common decorative technique on Samian ware (Peacock, 1982). This method of decorating involves using slip (a liquid clay) on a finished piece to produce a design.

This technique can be found on all tableware vessel types including but not limited to cups, plates, bowls, and dishes with everted rims (Johns, 1971).

Process steps

To create this decorative technique, the following steps were followed.

Step 1

Prior to making the piece, the slip was prepared, ensuring it is available for use. To make the slip, either dried or small pieces of wet clay were added to water and left to hydrate. The mixture was stirred occasionally to break up the clay and fully incorporate it into the water.

Once the clay seemed fully incorporated, it was passed through a strainer or loose-weave material to strain any course remaining pieces and ensure a smooth mixture. This is necessary, as the texture will flow smoother from the device and form the surface necessary for adherence of terra sigillata slip. The texture I have found which works best for me is that of a heavy cream, as this pipes well and holds its shape once applied.

Step 2

I shaped the vessel I planned to decorate on a wheel, using earthenware clay. While throwing, extra care was given to ensure a smooth surface, as due to the particle plate nature of terra sigillata, a smooth surface is necessary to provide the signature look.

Step 3

The piece was then left to dry slowly to a point where it was on the wet side of leather hard. This was bit wetter than the level used in the previous incised decorative technique, to limit the difference in moisture level between the thickened slip and the vessel. If needed, handles were applied in the same method as outlined in the incised method above.

Figure 20 Example of clay burnished with leather.

Step 4

The now partially dried piece was carefully trimmed as needed. As the piece was still damp and susceptible to marking, I found burnishing with fine cloth or smooth leather to work the best. This technique smoothed the prepared surface without marring the finish.

Step 5

Using decorative tools, the design was “drawn” onto the burnished pieces. For larger decorative elements items, I used a modified spoon to ensure smooth quick application to limiting the number of highs and lows in the piece. For minute details, the use of a piping tool ensured a smooth continuous element.

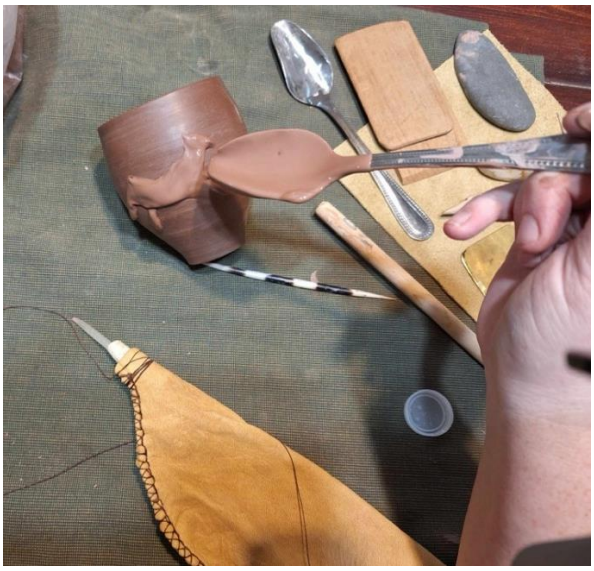


Figure 21 Design applied using modified spoon

Figure 22 Large elements complete.

Figure 23 Adding details to large element using piping tool

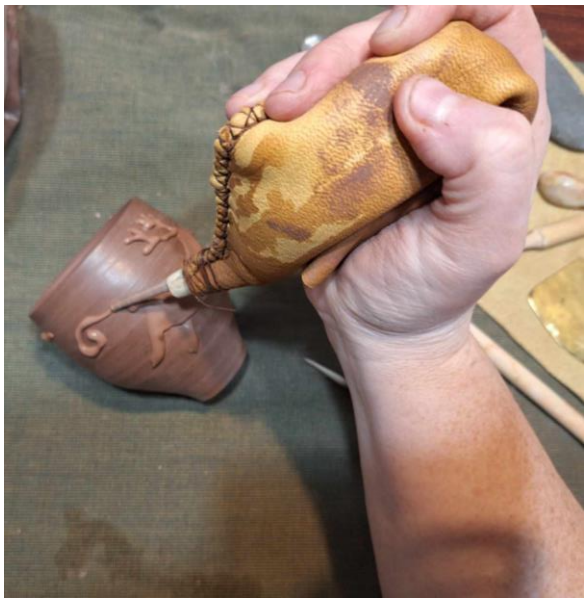


Figure 24 Adding additional elements to the overall design

Step 6

Following the decorative elements being applied, any mistakes or cleanup which were not done when applying the design were completed while the slip was still wet to ensure ease of removal.

For sharp edges, a porcupine quill worked best, while for smooth edges wet cloth or other soft items worked best.

Figure 25 Large element being cleaned up.

Step 7

The piece was left to dry slowly to ensure that the wet clay had time to adhere to the drier clay vessel. If the piece dries too quickly the slip may detach from the vessel. Once the slip is at least leather-hard the slip designed elements were burnished to remove any high or low points and the edges of the designs were smoothed. This process can be time-consuming, depending on how well the elements were applied. With practice and experience it is likely that the cleanup work would be minimized, as would the need for additional burnishing, making this technique still able to be created relatively quickly.

Once the piece is fully dry, it would move onto the application of terra sigillata slip, as outlined in the section below.

Figure 26 Finished Barbotine cups

Applied/Appliqué

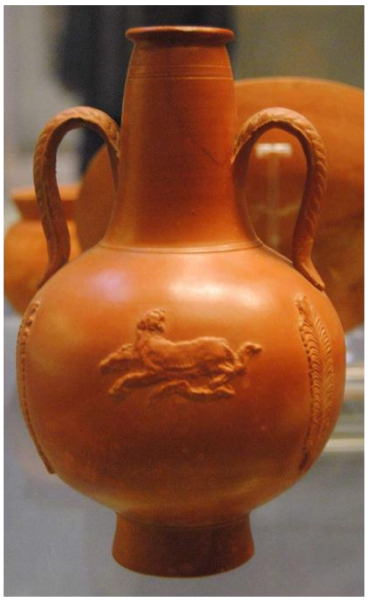


Figure 27 Example of Appliqué decoration (Bottle, n.d.)

Figure 28 Leaf / Vine mold.

Applied decoration was one of less-common of the decorative styles used on Gaulish or Arretine ware. This is likely due to the time necessary to decorate a single item (Johns, 1971) (Peacock, 1982). In applied, decoration elements are cast/molded seperately and then individually affixed using slip to the main vessel in the desired pattern.

The molds used to make decorative elements we often repeated on different vessels and could be made using stamps or positive images from metalwork items. For this process I created my leaf/vine mold by rolling a slab of clay and pressing a positive image from a tile onto the clay. I then fired the clay to form a mold which could be used repeatably later.

Slips are also used for this process. As the making of slip is described in the Barbotine decorative technique, I will not re-iterate it here.

Process steps

To create this decorative technique the following steps were followed.

Step 1

The shape seeking to be decorated was thrown on a wheel with earthenware clay. While throwing, extra care was given to ensure a smooth surface as, due to the particle plate nature of Terra Sigillata, a smooth surface was necessary to provide the signature look.

Figure 29 Mold piece created.

Step 2

The piece was left to dry slightly and handles were applied to the vase where needed using the technique described above.

The piece was left to dry slowly to "leather hard."

Step 3

The partially dried piece was trimmed and further smoothed by burnishing as needed.

Step 4

The mold pieces were created by pressing wet clay into the mold and removing and cleaning them up in preparation for application.

Step 5

Figure 30 Leaf molds ready for application.

The main vessel was scratched in a hash pattern where the appliqué mold pieces are to be affixed and a similar hash scratch was applied to the back of the appliqué mold pieces.

Step 6

Figure 31 Vessel ready for application of appliqué mold.

Slip was applied to the vessel and the appliqué mold piece, and they were pressed together gently. To ensure an even press I found starting at the middle of the mold and pressing toward the outer edge worked best. All excess slips was then removed to ensure a clean surface, and the edges were softened as the smoother the surface the glossier the final look.

Step 7

Additional elements such as barbotine or stamping can be added to finish the decorative motif. While I did not find this common, it could occur. I found for my use of leaves a barbotine vine proved easier and more organic than the vines in my mold.

Step 8

The pieces were left to dry slowly to ensure that the appliquéd pieces had time to adhere to the drier clay vessel. If the piece dries too quickly the slip may un-detach from the vessel. Once the slip is at least leather-hard dry the slip designed elements were burnished to soften the edges and remove any high or low points.

Once the piece is fully dry, I moved on to the application of terra sigillata, as outlined in the section below.

Figure 32 Finished applicque piece

Relief- Molded

Figure 33 Example of Relief-Molded decoration (Bowl, n.d.)

Relief-Molded decorations are one of the most well-known decorative styles of the Samian and Arrentine wares. These intricate designs display a wide variety of shapes and figures depicting various scenes on one vessel. Despite the complex look on these pieces, the vessels themselves, with the help of tools, could be easily and quickly produced.

Poinçons / Stamps

Figure 34 Double ended stamp (potter's stamp, n.d.)

Poinçons also known as stamps were used to impress motifs into the molds used for the relief mold process. They comprise of two parts: the surface with the negative motif and the handle. The decorative surface was designed on a slight curve to allow for them to be easily fit into the inner wall of the mold which they would be pressed. While any material could be used to transfer a design, such as shells, rocks, and carving tools, the man-made stamps were primarily made of clay.

These stamps could then be applied to various molds to create different motifs resulting in a single stamp being used on various molds (P. Comodi, 2013) (Johns, 1971). The uniqueness of these designs has proved helpful in categorizing relief-molded pottery to a region and date.

While stamps could be made by various workers, signatures on some of the stamps indicate that there may have belonged to a special artisan whose job it was to create these stamps, and that stamps as well as the molds they may have been sold or traded for use to other workshops (Peacock, 1982).

Vessel Mold

Figure 35 Part of bowl mold (Vessel-mould, n.d.)

The mold was a wheel-thrown vessel of fine smooth clay with its inner profile matching that of the desired outside profile of the final vessel. Due to natural shrinkage of the clay, the mold was larger than the desired final version of the vessel. The walls of the mold would be at least slightly sloped to ensure that the clay would be able to release. The molds often had a hole in the bottom to vent air and help with the drying of the clay pressed into the molds and ease the removal of the pressed clay. While not present on all molds, several molds have a rim on the side which would allow them to be set into a chuck to allow for quick transition between molds on one wheel (Taylor G. , Post Roman Pottery Why the wheels fell off, 2021). The walls of the mold would also be thicker than a traditional vessel to help remove moisture during the molding process.

The inside of the molds would be designed using stamps, carving tools, and roulette stamps. Some of the designs would repeat continually around the mold, while others formed scenes. Once decorated the molds were slowly dried and then fired in a kiln to stabilize them. The molds are also earthenware and fired between 1000C and 1100C they remain porous which is needed for the mold forming process.

Molds were re-used multiple times and, if well made, were able to create hundreds to thousands of vessels (Taylor G. , Stamping the Mould, n.d.). Pictures demonstrating the creation of the molds used for this process can be found in Appendix D.

Process steps

To create this decorative technique the following steps were followed.

Step 1

I prepared the mold by seating it in a chuck on a wheel head. The mold was affixed into the chuck using pieces of clay (often called lugs).

Figure 36 Mold placed in chuck on wheel.

Figure 37 Cylinder thrown.

Step 2

A cylindrical vessel was thrown on a wheel. The vessel was several inches taller then the mold which was used. I found that during this process if I trimmed the bottom edges of the foot and made the cylinder slightly bowl shaped it would form easier into the mold during the next steps.

Step 3

The cylinder was left to dry for a short time till it was able to be safely cut off of the bat and placed into the mold without malforming.

Figure 38 Cylinder placed into mold.

Step 4

While the wheel was turning, I pressed down on the bottom of the cylinder and pressed it into the side of the mold. While experimenting the wetness of the clay was important to ensure a smooth movement of the clay without being so wet as to slide and distort the shape. The press into the mold should be accomplished in one smooth motion. If more than one press was needed, the edges of the designs would shift, resulting in a muddied design.

The parts of the cylinder which extended above the mold were pulled up to form the rim and then were trimmed to ensure an even-sided shape. I was able to remove the mold from the rim and place the next mold on the chuck and throw the next piece.

Step 5

The clay was left in the mold until, due to the porous nature of the mold, it dried and pulled away from the edges. With continued practice I was able to determine when it was safe to remove. As with many things, patience is key: if you attempt to pull the bowl out early this will cause stress to the bowl or in my experience, I cracked the rim. The bowl should be left until it easily can be removed which in most cases took about twelve hours, depending upon the wetness of the clay.

Step 6

At this stage a foot can be applied to the bowl, if desired, by forming a clay coil or a donut of clay and attaching it to the bottom of a bowl on a wheel using the same scoring method use for applying a handle. This added clay can be pulled up, shaped, and trimmed to form a foot.

When attempting to form a foot the difference in the moisture of the clays along with my in-experience with this method caused me to apply to much pressure and stress to the bottom of one of the bowls developing in a crack during the firing process.

Step 7

The piece was left to dry slowly to leather-hard and then lightly burnished, ensuring that no designs are damaged and finally left to fully dry.

Once the piece is fully dry, it would move onto the application of terra sigillata slip, as outlined in the section below.

Figure 39 Finished relief mold process pieces

Application of Terra Sigillata Slip

The application of terra sigillata is done to unfired but dry pottery. The steps for applying the slip are almost identical, no matter which decorative technique is employed. The steps used for the application of this process are listed below.

Step 1

Research on application methods all stressed that the smoother the finish, the glossier the final piece. Application also needed to be made in such a way to allow consistency which, if not done correctly, would result in a streaky, inconsistent look. I attempted four methods for application.

1. Place the whole piece in the terra sigillata mixture, dip it and then allow it to dry and repeat this process between three and five times, waiting until the piece is dry between each application.
2. Place the whole piece in the terra sigillata mixture, dip it and then letting it dry and burnishing with a soft piece of leather then dipping again, and repeating this process between three and five times, waiting until the piece was dry between each application.
3. Brushing the mixture all over the piece while turning the piece on the wheel and then letting it dry and repeating this process between three and five times waiting until the piece was dry between each application.
4. Brushing the mixture all over the piece while turning the piece on the wheel and then letting it dry and burnishing with a soft piece of leather then dipping again and repeating this process between three and five times, waiting until the piece was dry between each application.

Dipping vs brushing proved to have a larger difference than I had originally thought. The application via brush required additional time and effort to ensure that the piece was uniformly applied and where it was not, streaking marks occurred. The dipping process provided an overall more uniform result with less effort. Given the number of vessels being produced this method would provide the best use of time and results.

There was a slight difference with the burnished pieces being a bit smoother in the overall look, then those simply applied. The extra time required to burnish can range from quick, with simple leather or fine cloth, or significant, with a stone as well as the detail on the piece. Which finishing step used would likely vary based upon the level and quantity of the vessel being produced. With the coarser wares (cooking and other utilitarian vessels) requiring larger quantities receiving the simple dip method and the more high-level table wear where quality was desired receiving this extra burnishing step.

It should be noted per Peacock,

“Burnishing is often used to finish vessels made by hand or on the turntable, but it is less commonly found on Wheel-turned products, presumably because burnishing by hand would generally offset the advantages of the wheel.”

(Peacock, 1982)

I did find that the extra time needed when the burnishing with a leather cloth was not excessive (when compared to not burnishing it only added a few extra minutes to each piece), and this soft leather/cloth brushing would have provided the extra shine. I would therefore propose that this method of burnishing may have been used on thrown pieces but not be as identifiable as burnishing using a stone which can be identified by the marks which it leaves on the pieces.

Step 2

Once the slip is applied, the pieces are left to fully dry again. This second drying step is necessary to ensure that the slip will fully adhere to the piece, otherwise the slip may flake off or not adhere fully. Based upon my research the recommended time to dry is between a few hours to a full day depending upon the environment.

I had attempted to shorten this drying time due to a timeline and for an experiment and found that when I only let the pieces dry for an hour or two and then attempted the fire the pieces which were not fully dry were not as glossy and were not as well sealed. Ultimately, these pieces leaked water after firing.

Step 3

Once fully dried any final burnishing can be done and the final pieces are now ready for the firing in the Kiln as outlined in the steps below.

Firing the Piece

The various decorated pieces are all placed in the kiln together to fire. To ensure the best use of space shapes were stacked tightly into the kiln on top of and inside of each other in preparation for firing.

Unlike modern glazed pieces we are familiar with, these unfired pieces are only fired a single time. During this firing pieces are fired to a temperature of 1,000C to 1,100C and then slowly cooled. Once cooled the pieces are ready for use.

Figure 40 example of stacked pieces in Kiln in La Graufesenque (Çizer)

As each clay variant has a different maturity level, I experimented with running pieces between 1,000C to 1,100C and found that the best results I received for my Terra Sigillata mixture using my clay body (good color, glossy look, water permeability) were achieved between cone 05.5 and 04 (1,004 C to 1,046 C).

Summary / Conclusions

Examination of the various decorative techniques of this region as well as re-creating the process provided me with clearer understanding how this style of pottery is so prolific to the point of being common for a Roman despite the region and period constrictions.

The decorative techniques, while impressive to view, lend themselves to quick reproduction with the fastest of the techniques (relief-mold) representing most of the decorated findings and those which take the most time (appliqué) representing fewer findings.

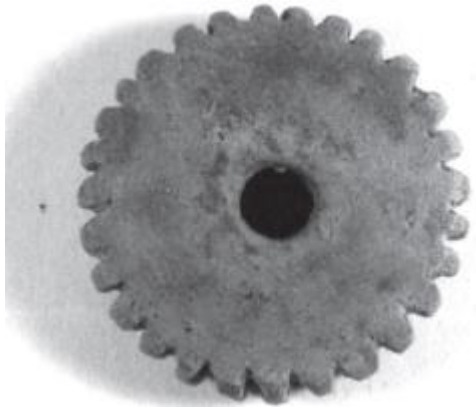
While each decorative technique (especially appliqué) could be done start to finish each of these techniques could easily be split into multiple roles (Preparer of clay, thrower of vessel, decorator of vessel, finisher, applier of slip, kiln operator) without much change to the flow of the pottery and instead would speed up the process to an extent excluding drying time. This assembly method produces finer ware with no appreciable difference in time for creation than simpler ware.

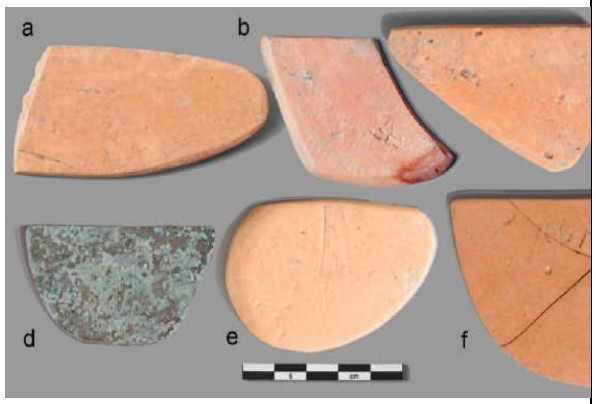
As much as possible for each decorative technique I set up multiple stations to perform different tasks and found that moving between stations could be applied naturally to the process and increased efficiency overall. Using this method, I was able to complete each step quickly. This is like the modern assembly method. An individual performing a specific task would gain proficiency at their set task and would be able to complete the task deftly. This leads me to believe that, especially for the relief molds forms, pieces could be produced with only minutes of hands-on time.

Research into this topic and process, as is often the case, has opened several other avenues for further research including to studying the movement of the craft following the expansion of Roman influence, cultural influences on design motifs and techniques, how geographic and resources shaped and created new techniques (black ware), and the movement of artisans with the craft as tracked through signature marks. These I will save for another project and will now close this project with the knowledge that, while I now am familiar with the process, only continued practice will help me master the techniques.

Appendix A

Tool Type	**Description**	**Extant examples**	**Tool used to reproduce process**
Poinçons / Stamps	Hand-crafted tools used to impress negative designs either into a mold or directly onto the pottery.		

Polisher	Smooth items such as pebbles and leather used to polish the surface of thrown and slipped pottery.	 (Poblome, 2012)	
Roulette Wheel	Small disk with notches or designs cut along the outer edge to produce a repeating stamped design.	 (Ciauescu, 2004)	

Potter's Rib	Pottery scrapers occurring in a variety of shapes and materials used to shape pottery when throwing on a wheel	 (Poblome, 2012)	
Point Tool	A group of artifacts including Stylus, needles, or other thin elongated items ending in a fine point.	 (Poblome, 2012)	
Knife	Knife blades used for various cutting and carving.	 (Poblome, 2012)	

Slip trailer	Device used to hold and slip which was then applied to pottery for various shapes.	 No extant examples exits that I am able to find. I instead used the proposed replica design used by Graham Taylor (Taylor G. , The Chase: Barbotine Hunt Cup Decoration, 2021).	 
Chuck	A ceramic form which molds can be placed in to help with forming wet clay may be placed for trimming.	No extant examples images exits that I am able to find. Their existance is supported by the shape of the relief molds and their use commented on by Graham Taylor (Taylor, 2021).	

Mold	Preformed shape made from a porous material (such a clay). These can be used to form small shapes for applique or larger forms for cups and bowls.	 Medallion Mode of Stag (Mariana Andone-Routaru, 2018)  Terracotta mold for bowl (Vessel-mould, n.d.)	 

Appendix B

Average chemical composition of slips	Na_2O	MgO	Al_2O_3	SiO_2	P_2O_5	K_2O	CaO	TiO_2	MnO	Fe_2O_3	BaO
Graufesenque (n=78)	0.08	0.95	23.22	55.70	0.17	8.02	1.39	0.72	0.05	9.63	0.08
	(0.06)	(0.22)	(2.37)	(2.79)	(0.04)	(0.85)	(0.87)	(0.10)	(0.01)	(1.00)	(0.02)
Le Rozier (n=3)	0.05	1.11	22.60	58.69	0.15	6.31	1.01	0.71	0.04	9.24	0.08
	(0.01)	(0.08)	(0.15)	(0.63)	(0.01)	(0.86)	(0.06)	(0.05)	(0.01)	(0.19)	(0.01)
Espalion (n=36)	0.05	0.91	25.28	54.69	0.21	6.66	1.08	0.77	0.06	10.23	0.07
	(0.02)	(0.16)	(3.05)	(3.79)	(0.06)	(0.60)	(0.39)	(0.10)	(0.01)	(1.06)	(0.02)
Carrade (n=13)	0.08	0.99	29.00	52.50	0.18	4.93	0.76	0.84	0.05	10.58	0.08
	(0.04)	(0.22)	(3.19)	(3.43)	(0.04)	(0.50)	(0.20)	(0.15)	(0.01)	(0.83)	(0.01)
Aspiran (n=8)	0.87	1.43	22.49	55.81	0.17	7.63	1.17	0.71	0.04	9.61	0.07
	(0.17)	(0.59)	(2.20)	(2.89)	(0.05)	(0.91)	(0.19)	(0.15)	(0.01)	(0.96)	(0.01)
Montans (n=37)	0.32	1.15	31.12	44.96	0.13	9.47	1.44	0.78	0.05	10.52	0.07
	(0.14)	(0.22)	(1.39)	(1.39)	(0.09)	(1.69)	(0.53)	(0.15)	(0.01)	(1.43)	(0.02)
Italic (n=39) (Arezzo, Pise)	0.95	3.23	26.94	49.51	0.12	6.58	1.53	0.58	0.07	10.38	0.09
	(0.37)	(0.45)	(0.60)	(0.77)	(0.02)	(0.90)	(0.48)	(0.08)	(0.02)	(0.61)	(0.02)
Arezzo «Ateius» (n=5)	0.94	3.70	26.23	48.67	0.11	7.07	1.89	0.51	0.07	10.71	0.09
	(0.12)	(0.15)	(0.49)	(0.33)	(0.01)	(0.32)	(0.72)	(0.04)	(0.02)	(0.18)	(0.02)
Arezzo «Perrenius» (n=5)	0.55	3.33	27.26	50.38	0.13	5.58	1.12	0.62	0.07	10.87	0.09
	(0.15)	(0.45)	(0.25)	(1.10)	(0.03)	(0.21)	(0.41)	(0.07)	(0.02)	(0.40)	(0.03)

Figure 41 Chemical composition of Slip (Yoanna Leon, 2014)

Sample	Provenance*	SiO_2	S.D.	Al_2O_3	S.D.	Fe_2O_3	S.D.	CaO	S.D.	MgO	S.D.	K_2O	S.D.	Na_2O	S.D.	TiO_2	S.D.
Body																	
03	GL	53	1	23·0	0·6	5·3	0·5	13·4	0·4	1·2	0·2	3·6	0·3	0·37	0·07	0·4	0·2
12A	GL	59	1	20·6	0·9	5·0	0·2	10·8	0·5	1·2	0·2	3·0	0·1	0·34	0·08	0·5	0·2
14B	GL	54	1	23·4	0·8	6·0	0·7	10	1	1·9	0·1	4·4	0·8	0·5	0·2	0·7	0·2
06C	IT	55	1	19·3	0·2	8	1	9·2	0·6	3·5	0·2	2·7	0·2	0·9	0·3	0·5	0·2
13C	IT	60	2	17·4	0·6	6·2	0·6	9·4	0·9	3·3	0·2	2·8	0·4	1·6	0·2	0·5	0·1
13E	IT	50	3	18·4	0·4	9	1	15	2	3·2	0·3	2·5	0·3	1·0	0·2	0·6	0·2
05B	LC	53	1	20·1	0·7	10·1	0·8	1·6	0·3	8·6	0·1	3·6	0·2	1·7	0·2	0·5	0·2
05C	LC	55	1	20·5	0·6	9·1	0·6	1·7	0·2	7·9	0·1	3·9	0·2	2·0	0·3	0·6	0·2
16G	LC	55	2	20	1	9·3	0·9	1·8	0·4	7·6	0·7	3·8	0·4	1·9	0·2	0·46	0·09
13A	PV	55	1	23	1	9·5	0·7	1·8	0·4	5·4	0·6	4·0	0·2	1·4	0·4	0·5	0·2
22	PV	52	2	25·1	0·8	11·6	0·7	1·1	0·2	4·5	0·4	3·9	0·2	1·3	0·3	0·57	0·06
28	PV	53	2	22	1	10·1	0·8	1·8	0·3	6·7	0·5	3·5	0·2	1·6	0·1	0·7	0·2
Slip																	
03	GL	47·1	0·7	27·2	0·8	12	1	1·9	0·5	1·3	0·2	9·6	0·4	0·3	0·1	0·8	0·3
12A	GL	53	1	23·4	0·9	12	2	1·5	0·3	1·8	0·2	7·8	0·7	0·4	0·1	0·4	0·1
14B	GL	55	3	23	2	10	1	1·1	0·1	1·0	0·2	7·9	0·6	0·3	0·2	0·5	0·2
06C	IT	49	1	29·0	0·8	9·0	0·4	2·6	0·5	2·5	0·2	6·3	0·6	0·8	0·2	0·8	0·1
13C	IT	48	2	26·8	0·8	12	1	1·3	0·2	2·6	0·1	6·7	0·2	2·3	0·2	0·5	0·1
13E	IT	50·4	0·5	27·7	0·5	9·7	0·4	0·85	0·08	2·5	0·2	7·5	0·4	0·8	0·2	0·6	0·2
05B	LC	48	1	31	1	10	1	0·7	0·1	3·5	0·8	4·1	0·3	1·6	0·3	0·6	0·1
05C	LC	45·2	0·9	31	3	14	2	0·9	0·3	3	1	3·8	0·6	1·5	0·4	0·8	0·4
16G	LC	44	2	31	2	14	3	1·2	0·4	4	1	4·2	0·9	1·8	0·3	0·4	0·2
13A	PV	41	1	30·7	0·7	23	2	0·6	0·1	1·0	0·1	3·2	0·2	0·6	0·1	0·32	0·08
22	PV	40·8	0·9	31·1	0·8	22	2	0·47	0·08	1·3	0·2	2·3	0·2	0·6	0·2	0·8	0·3
28	PV	38	2	40	1	17	1	0·4	0·1	1·5	0·2	1·8	0·2	0·7	0·3	1·1	0·2

Figure 42 Chemical composition of slip (Piero Mirti, 1999)

Appendix C

The ingredients in the creation of terra sigillata slip are simple and few.

1. An Iron rich clay with fine particles of an Illite nature
2. Deflocculant of either sodium, potassium, chlorides, or carbonites
3. Water

I used Red Art dried clay supplied by Clay Art Center in Tacoma Washington. This was chosen following discussion with their slip makers regarding their clays available and their experience making slip they make for resale.

Historical artisans making this would have taken the ash from burned plant material and mixed it in water. As potassium and sodium are water soluble, the particulates would have been filtered out and then the water left to evaporate; the remaining residue would have formed the deflocculant. For the deflocculant I used soda ash, also acquired at Clay Art Center, to ensure a pure mixture and more reliable results.

Step 1: The clay, deflocculant, and water are mixed in a container/vessel.

Figure 43 Ingredients


Figure 44 Ingredients immediately following combination

Step 2: Once the mixture has separated, the middle layer containing the finer particles are siphoned out, forming ~~the~~ terra sigillata.

Figure 42 Mixture after setting two hours.

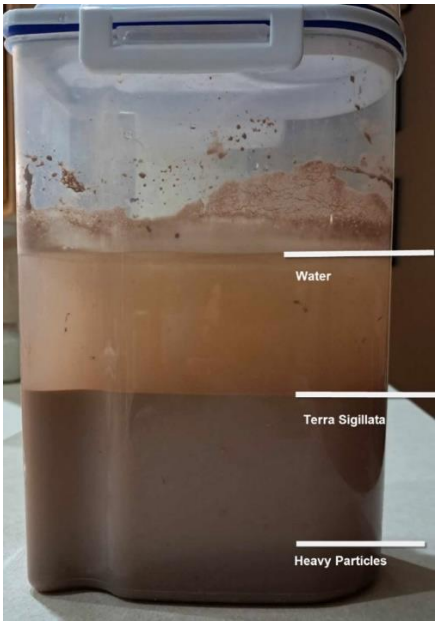


Figure 45 Mixture after twenty-four hours.

Figure 46 Siphoning off terra sigillata layer

Figure 47 terra sigillata removed from original mixture

Step 3: Terra sigillata slip is further reduced by evaporation or by heating slowly. Once the desired thickness is reached, the terra sigillata is ready for use, or can be stored for future use.

Figure 48 Mixture reducing by heating

Appendix D

Step 1: Molds are thrown using a similar body style of clay. The inside of the bowl is smoothed to ensure an easy release of clay, and a hole is placed in the bottom to allow for airflow in drying and minimize suction of the clay to the mold.

Figure 49 Thrown Mold

Figure 50 Leather-hard burnished mold ready for decoration.

Step 2: Once the mold has dried to leather hard the inside is decorated using stamps, carving tools, and roulette wheels taking care to support the outside of the mold when decorating to ensure the shape does not warp.

Step 3: The mold is left to dry and then is fired in the kiln. Once fired the mold is ready to use.

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