

# Ceramics made by Alchemists

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Ceramics or earthenware have not gotten much attention in their connection to alchemy. Porcelain and glassworks were considered to be more 'noble'.

Potters blend earthly materials like clay, stone, and ash, into complicated glaze mixtures. Then through fire, these base substances transform into precious works of art. The interest of alchemists in ceramics was related to the fact that they had to manufacture all kinds of pots, including crucibles, which had to withstand very high temperatures for melted metals. Their knowledge of glass blowing is also explained by the same reason. They were able to remedy the porosity of the pottery with glaze and enamel, but at the same time they could also embellish the ceramics in general. So alchemists were constantly looking to improve their pottery and earthenware to both withstand the force of fire and chemicals, and to make beautiful works of art.

Ancient Egyptians experimented with coating their clay objects with a bluish-green substance to make them non-porous. This was a glaze composed of quartz, soda, and a mineral containing copper which when fired covered the clay bowls and vases with a glass-like surface.



*Egyptian hippopotamus, 2<sup>nd</sup> century B.C. The turquoise color is due to the use of copper in the glaze. The Metropolitan Museum of Art, New York.*

In the 9<sup>th</sup> century, Abbassid potters of the Islamic Civilization developed Lustreware, an alchemical decorative techniques involving the use of a lead-based glaze and silver and copper paint to create a golden shine on a pot, but there is no real gold present. In their alchemical thinking this was a kind of 'transmutation' of lead into gold. The golden metallic shine only occurs when there are dense nanoparticulated layers of glazes, several hundred nanometers thick, which enhance and broaden the reflectivity, shifting the color of the reflected light from blue to green-yellow. These shifts are only achieved with a high lead content, which potters deliberately increased over time. The addition of lead reduces the diffusivity of copper and silver in the glazes and helps the development of thinner luster layers with a high volume of nanoparticles. Of course the alchemists didn't know about nanoparticles, it was all the result of many trials and errors, and constant improvement.

The Lustre-paint is painted onto the surface of an already made and fired vessel. It is then heated again in a special kiln that only heats the pot until the precious metals fuse to the surface. If the kiln is too cool, the metals will not fuse to the glaze; if too hot, the entire paint, including the earth and iron-oxides, will fuse to the surface. If too much oxygen gets into the kiln, it will vaporize the precious metals, if not enough, the pot will turn black. The alchemists had to have a high degree of control over the process, and their technique was a closely guarded secret.



*A Lustre bowl from Syria, made between 1075 and 1125*

*The Royal Ontario Museum, Canada*

Tin was a metal that alchemists were well acquainted with. They were probably behind the tin-glazed enamel on bricks found in the Monastery of St. Paul in Leipzig, which was completed in 1207. The tomb of Henry IV of Silesia, dating from 1290, was also covered with tin-based enamel. Tin was added to glazes in order to give them an attractive white color in Florence and Tuscany by the 14<sup>th</sup> century.

Glazed works were also, at times, referred to as *glass*, a point made in relation to tin glaze in the alchemical treatise of Petrus Bonus from circa 1330. Arguing that metallic spirits are vitrified under the "violent action of fire," Bonus points out that,

"Even lead and tin become glass when their metallic humour is burnt out of them, and it is rank absurdity to say that the vitreous humour is malleable, or ever can become so; for it is the metallic humour which renders metals malleable and fusible." (from his *Pretiosa Margarita (The New pearl of Great Price, 1330)*)

By this he meant their vitrification in glazes. It provides a chemical explanation for associating glass and glaze, arguing that lead and tin undergo an alchemical process of fundamental change that causes them to lose their malleability as metals and become glass.

This text shows that the alchemists were also familiar with the lead-containing glaze. The process is found in an art treatise with a number of alchemical recipes. Albertus Magnus was a German philosopher and alchemist, who was the first to isolate the element arsenic in 1250. In his *Libellus de Alchimia* he has a recipe "to glaze ceramic". One had to smear the earth with a mixture of red lead and vinegar and then put the whole in the fire.

Given the decisive role of the alchemists in the most important stages of the history of ceramics and also of glass, we are inclined to assume that they also contributed considerably to the discovery or improvement of glazes. For centuries they had enriched their knowledge of the metals and other products for their composition, and mastered the techniques of firing.

In the mid 15<sup>th</sup> century, we have another type of pottery, called maiolica (or spelled majolica in the 17<sup>th</sup> century), that came to Italy through Spain from Moorish craftsman. Maiolica was made by a tin-glaze process resulting in an opaque white glazed surface decorated with brush-painting in metal oxide enamel color(s).





*Tin-glazed earthenware with copper luster maiolica, Moorish Spain, mid 15th century. The J. Paul Getty Museum*



*-glazed earthenware Maiolica, Italy, around 1555*

In the 16<sup>th</sup> century, an alchemist, Bernard Palissy, struggled for 16 years to make porcelain. Instead he developed another type of pottery, now called *rusticware*, or *Palissy ware*. Rusticware are typically highly decorated large oval platters featuring small animals in relief among vegetation, the animals apparently often being molded from casts taken of dead specimens.

Very little is known about the life of this master potter, but we have enough elements to conclude that he devoted it entirely to his art, for which he made tireless efforts. He owed his extraordinary discoveries to his chemistry and geological knowledge, which can be found in his writings.

He is a typical alchemist, who was obsessed with his laboratory work despite his enduring poverty. Unlike so many other alchemists, he succeeded in producing a beautiful and unique product with which he could make a living.

Palissy's was not only practical but also metaphysical. As a Paracelsian adept, he subscribed to the Neoplatonic notion of cosmological harmony between man-microcosm and universe-macrocosm, since the divine soul of the creator animated all creation. The adept could anticipate the process of redemption through alchemy, the separation of pure from impure by fire.

Palissy was probably born in 1510. At first he was an itinerant painter-glassblower, but around 1539 he settled in Saintes (France). He made a living by painting and designing. One day, a wealthy man in the neighborhood of Saintes showed him an earthen cup from his collection. It was turned and enameled with so much beauty, that, at the sight of it, Palissy artist was struck dumb with admiration. The cup probably was Italian porcelain, because no man in France could make white porcelain or enamels. This spurred Palissy to search for a way to make enamels as this would provide him with a good income.

"I was shown a turned and enameled earthenware cup that was so beautiful that I could not agree with myself... I thought that if I found out how to make enamel, I could make earthen bowls and other beautiful pieces, because God had given me painting talents; so despite knowing nothing of potting soil, I began to search for glazing, like a man groping in the dark."

For Palissy, the white glaze of the cup signified the astral spirit materialized and then merged with the macrocosm in enamel. He began by making a furnace, and having bought a quantity of earthen pots, and broken them into fragments, he covered these with various chemical compounds. He melted them at furnace heat. His hope was, that of all these mixtures, some one or other might run over the pottery in such a way as to afford him at least a hint towards the composition of white enamel, which he had been told was the basis of all others. He labored for several years without any success, and his family was driven into poverty.

Three years later, commissioners deputed by the king to establish the salt-tax in the district of Saintonge had arrived in the town. They appointed Bernard Palissy for the task of mapping the islands and the countries surrounding all the salt marshes in that part of the world. It was a profitable job, and would occupy him many months.

He resumed his pottery work in search for enamels, but with little success. In an act of desperation, he put 300 kinds of trial pieces in the oven, of which there was one that turned out white and polished. He thought that he had finally found the secret of white porcelain, but it was actually another kind of ceramic.

He then began to make his typical dishes ornamented with local flora and fauna and glazed with many colors. The colored glazes were the result of his many years of adding different metals to it. Palissy was the first to make casts from life animals, with which he decorated his enameled stoneware, from 1555 on. It teems with flora and fauna that he collected by slogging through the marshes of France.

He made a new and better oven, to continue his search for making the new white enamel did it did not melt as before. He couldn't figure it out why. His wood supply ran out.

"...I was forced to burn the palings which maintained the boundaries of my garden, which being burnt also, I was forced to burn the tables and the flooring of my house, to cause the melting of the second composition. I suffered an anguish that I cannot speak, for I was quite exhausted and dried up by the heat of the furnace ; it was more than a month since my shirt had been dry upon me. Further to console me, I was the object of mockery; even those from whom solace was due ran crying through the town that I was burning my floors. In this way my credit was taken from me, and I was regarded as a madman." "

He recruited another potter, a Huguenot in hiding. Palissy was a Huguenot himself and out of pity, he provided his new friend with free meals and lodging at an inn for six months. The Huguenots were a religious group of French Protestants who held to the Reformed, or Calvinist, tradition of Protestantism. They were constantly persecuted.

An accident occurred, the flint embedded in the mortar of his new oven, burst and splintered because of the heat and embedded themselves in all the dishes, therefore ruining all the commissions he had for his clients. However Anne de Parthenay, the wife of a nobleman introduced him to the duke de Montmorency, who hired Palissy to decorate his castle with architectural works, based on Palissy's designing skills of animals and plants. After all, Palissy was a remarkable hydraulic engineer. We know a Truité des Fazur et Fontaines by him. Thanks to this knowledge and his skill as a ceramist, he managed to devise mysterious caves, populated with ceramic figures or animals

It took Palissy some sixteen years, several ovens, and many trials to fire different enamels to produce his colorful rusticware. Modern analysis confirms that Palissy used colored lead glazes, lead silicates with added metal oxides of copper [for green], cobalt [for blue], manganese [for brown and black], or iron [for yellow ochre], with a small addition of tin [for opacity] to some of the glazes.

The pottery made by Palissy was very characteristic of himself. He was a naturalist, and had a keen, innate love of the beautiful. To reproduce, in his

works, he used the bright colors and elegant forms of the plants and animals he found in the woods and fields. He founded his reputation on what he called rustic pieces. The title which he took for himself was, *Ouvrier de Terre, et Inventeur de Rustiques Figulines* (Worker in Earth, and Inventor of Rustic Small Models). These were accurate models from life of wild animals, reptiles, plants, and other productions of nature, tastefully introduced as ornaments upon a vase or plate. All the designs were accurately copied from nature, in form and color, and every species can be readily recognized.

Although Palissy was Protestant, nobles protected him from the ordinances of the parliament of Bordeaux. In 1562, it seized the property of all the Protestants in this district. Palissy's workshops and kilns were destroyed, but he was saved. By the interposition of the all-powerful constable, he was appointed inventor of rustic pottery to the king and the queen-mother. While he was working for the court, he produced numerous and varied works. In addition to continuing rustic figurines, he made a large number of dishes and plaques ornamented with scriptural or mythological subjects in relief. Eventually, he was condemned to death because of his religious beliefs when nearly eighty years of age. He died in a Bastille dungeon in 1590.



*Palissy ware, 1550*





*Lead-glazed earthenware, probably by a follower of Bernard Palissy, 1510–1590*  
*The Metropolitan Museum of Art, New York, NY*

There is no doubt that Bernard Palissy had a thorough knowledge of alchemy, but certain theories he strongly rejected. As a strange side note, Pierre de l'Etoile recounts a curious incident in his Journal: "When he died, this good man left me a stone which he called the philosopher's stone; he assured me that it was a skull that had turned to stone with time, along with another, which he used in his work; these two stones are in my cabinet, I love them and keep them carefully as a reminder of this good old man."

Pierre de l'Etoile believed in the possible transmuting powers of these stones, but



Palissy himself denied the possibility of transmutation. He did recognize the importance of distillation, showed its usefulness for medicine.

The tract *Pirotechnia* by the Italian Vannuccio Biringuccio, published in Venice in 1540, thanks to a privilege of the Pope and the city senate, contains a wealth of information on the knowledge of the alchemists, both in metals, glass and ceramics. In his *Exposition on the Art of the Small Figurines and Some of Its Secrets*, he clearly gives the reasons why the alchemists practiced pottery.

"I have already spoken about the work with potting soil, but it seems appropriate to me also to refer to the processes of this art, in which one can expect perfection without the aid of fire, which also applies to glass and its colors, by the way, materials composed of metals or raw minerals. Since, it is an art of fire and I want to deal with fire, the metals and the minerals, I must also speak about the art of pottery. It is based on two main elements, that of drawing and that of the mysterious and many secrets of alchemy".

Biringuccio then points to the role of alchemy in the manufacture and application of glazes and enamel colors, the technique of firing and the choice of a good quality earth. His treatise influenced knight Cipriano Piccolpasso, who wrote *Three Books of Pottery*, dating from 1548. Piccolpasso was an alchemist. In his treatise, he pursued a clear goal, namely to encourage all alchemists to improve ceramics by incorporating their knowledge into it. However, he also criticized alchemists for their secrecy and certain beliefs such as that proper metal-working required all sorts of esoteric factors, such as proper planetary alignments and the tuning of the inner soul of the practitioner.