

# Archaeometric analysis proposal for negative decoration

## Summary

The main purpose of this text is to offer what could be a kind of road map within the possible archaeometric protocols to address the old problem posed by ceramics with negative decoration and the possible relationships that would have occurred between Western Mexico and South America. A perspective is also offered on what is negative from a technological point of view, according to ethnoarchaeological analyses, important since despite the great temporal distance that separates us from the makers of this ceramic decoration (possibly men and women) ethnoarchaeology. It provides clues to make better questions about the archaeological context.

Volume 8 Issue 2 - 2023

**Aldebarán Vásquez Grueso**

Researcher, Colombia

**Correspondence:** Aldebarán Vásquez Grueso, Researcher, Colombia, Tel 00573133817382, Email aldevez86@gmail.com**Received:** April 22, 2023 | **Published:** May 12, 2023

## Introduction

Negative pottery is still today a technique that raises more questions than answers, despite appearing since 1500 BC in western Mexico, in the Opeño,<sup>1</sup> and which is related to the process of contacts, of various kinds, between South America and Western Mexico: it presents, to date, no comparative analysis in which it is precisely answered whether the response to the contacts is positive or not.

Our text is a contribution to this path, started decades ago by other researchers, who should undoubtedly be credited for having asked this question before the person who writes these lines today. The foregoing makes it necessary to return to part of what has been said so far regarding this ceramic, which is nothing more than a small state of the art on the matter, which, although it focuses only on style, will be a starting point to go from the exterior, and therefore visible, to what is not seen, more closely linked to fields of earth sciences (geology) and chemistry.

Carrying out a proposal for a possible archaeometric approach to negative ceramic decoration, within the framework of cultural interaction and its possible supra-regional relationships, is an important issue for archaeology: procedural approaches of this type, together with theoretical, methodological and Conceptual, are relevant to provide answers about the possibilities or not of pre-Hispanic relationships between the ancient cultures of the current territories of Mesoamerica and South America.

A question that can be asked at this point in the text is why ceramics? The short answer could be its appearance in both archaeological contexts in a more or less abundant way, despite the chronological differences between both regions (a topic addressed in subsequent pages). Jiménez allows us to point out other elements of analysis to take into account: "Ceramics are the product of one of the oldest activities of the human being, as it satisfies physical, social and spiritual needs".<sup>2</sup>

It is not the purpose of this document to delve into the hypotheses around the elaboration of ceramics with negative decoration as an element that would have met needs such as those exposed by Jiménez.<sup>2</sup> Getting into that debate would be something profound, which would certainly take me a long way from the concern that led me to write this text, but I want to take a few paragraphs to perhaps contribute elements to consider.

Appadurai<sup>3</sup> contributes to the present discussion the need to contextualize each element and its society, a causal relationship in

which the subjective burden of the social actors will be ideologically imprinted, which in this context would be somewhat broader when focusing the gaze towards pre-Hispanic groups of Mesoamerica and South America (the same ones that would have to be delimited very well for a more accurate investigation).

A concept to reflect on is that of the so-called "contents of power"<sup>3</sup> in which the political-social dynamics revolve around the ultimate goal of consolidating the possession of certain goods in relation to social differences. as a reflection of status and power.<sup>4</sup> With this we could better refine the type of questions that we should ask ceramic contexts, where do they appear, what are they associated with, ritual use, daily use, in what type of burials are they found, are they recurrent throughout a chronological period? Or, on the contrary, do they appear to consolidate differences between sectors?

We can think of a prestigious relationship, by virtue of the reduced scale of appearance of this ceramic decoration, which would make those who had access to ceramics with this type of decoration stand out socially, due to its scarcity; Or, otherwise, something common and recurring. In the background of the discussion, the need to see this material element from its value in a rhetorical, social and political context is clear, as Appadurai explains:

I suggest that we view luxury goods not so much in opposition to necessities (an opposition fraught with problems), but as goods whose main use is rhetorical and social, goods that are simply embodied signs. The need to which they respond is fundamentally political.<sup>3</sup>

Prestige, returning to Uña and Hernández (2004:1120), (quoted in Aguilar 2013:23)<sup>5</sup> will be a dual category, since it would include "the sphere of honor, enhancement, esteem, and the second is close to respect, to the ascendant and to the authority for social approval, that deserves something or someone...". The natures presented by Uña and Hernández allow a divergence between tangible, material, and subject goods.

Its importance lies in the union of these as something indivisible, to the point that separating one from the other makes the argument worthless. We cannot ignore power, a central theme in authors such as Appadurai,<sup>3</sup> Uña and Hernández (2004). Power is associated with the ability to do, in terms of the actions of an individual or a group, also in the actions that other subjects may or may not carry out Power, seen from another perspective, also contemplates goods, material equipment, generally with restricted access, elements used by a small group to deepen the social differences within their group.

I dare to say, partially until now, that negative ceramics would fulfill that role in Mesoamerica and South America, being used as a material and symbolic element through which the elite that would have access to it displayed their rhetoric of power and symbolisms, resulting in social cohesion in their groups. I do not have in-depth comparative analysis, I accept it and I am aware that this investigative edge is something to carry out at other times, given the depth of the academic undertaking that such a challenge implies.

### Presentation of the problem

As for the ceramic negative, it can be defined from the words of Shepard (1956: 206) as a technique in which the pigment is not present and the motifs contained in the ceramic stand out. Kojima, for his part, offers a critical view of the topic to be considered:

The term “negative” in archeology refers to those ceramics that have drawings that apparently were covered with some material such as wax or sticky paste, to prevent penetration of the dark dye that will later be applied to the entire surface. The drawings, when removing the material with which they have been covered, remained with the light, original color of the clay, which was beautifully highlighted by the contrast with the dark background. As for the method with which they would have worked the pottersprehispanic to make this kind of pottery, no there is no logic that defines it.

Archaeologists often have no more than one vague idea or another, and the most widespread assumption among them is that artisans pre-Hispanic would draw the lines with wax on the surface of the pottery and then they would paint the entire surface with a dye to take her later to cooking.

However, the existence of the practice of staining the gourds of I zalco and the experiment carried out on this occasion, has shown us that there is a great possibility that said pre-Hispanic ceramic was not painted but dyed.<sup>6</sup>

The first places where there are archaeological records of the appearance of this ceramic are located in South America, particularly in Ecuador and Peru, and a little later in Colombia,<sup>7-9,1</sup> regarding the temporal range, it is around an estimate of 2000 years BC. In the case of Virú, Peru, there are estimates of an antiquity between 2000 BC and 1250 BC;<sup>10</sup> For the Ecuadorian context, the transition period between the Valdivia 4-7 phases, dated 2600-2000 BC, is taken as the point of origin. In this regard, Marcos comments:

There are a few examples of vessels in which the use of the controlled smoking to create negative designs, showing a close-up successful attempt at production of polychrome decoration (suede-red-black). In plastic decoration include vessels that present corn plants with their ears (Marcos 1999: 137).

In the Mexican case, this ceramic appears in the West, Michoacán, in the context of the Formative,<sup>1</sup> a little later than in South America, in the archaeological site of ElOpeño.<sup>1</sup> It is worth saying that for the Mesoamerican context, more studies are needed on the manufacturing technique and decoration of this ceramic, as stated by Filini (2014:221)<sup>11</sup> “To date, no archaeometric studies have been carried out that elucidate this poorly defined technique”.

Changing the subject a bit, Before addressing the archaeometric part itself, it is relevant to expose the analysis made by Kojima<sup>6</sup> regarding the production of this ceramic in contemporary times, which contributes an approach from ceramic ethnoarchaeology to the attempt to understand the possible, or the possible pre-Hispanic manufacturing techniques used to achieve the decoration on the negative.

### Hideo Kojima and negative ceramics in El Salvador

The Lencas are a people of pre-Hispanic origin who currently inhabit San Salvador, a country located in Central America. The history of this town goes through several considerations, one of them is that its linguistic affiliation is not very clear, taken from Lemus:

They populated the eastern part of the country (Usulután, San Miguel, Morazán and La Unión) and had as natural border the Lempa River that separated them from the Pipil peoples. The lencas Salvadorans, also known as potones and chilangas, separated of the lenca Hondurans long before the Spanish conquest both in Honduras as in El Salvador, the lencas stopped speaking their language middle of the last century. The linguistic affiliation of this is not clear. language(...) (Lemus nd: 5).

The processes for the elaboration of ceramics, mainly comales (form used for feeding and food preparation) begin with obtaining the raw material, as is to be expected. In our case we want to focus on aspects related to dyes. For this reason we wish to return to the general description offered by Kojima,<sup>6</sup> to describe how the process was done at another time, with more specific details:

The technique they use to color the pots black is unusual, as they bathe the hot, freshly baked pots with the infusion of a “plant” called nascalote, which instantly changes the original color of the clay to black. This last description surprised the author, since they were precisely explaining a dyeing technique with tannin and mordant of iron, that is, the vessels were not painted but dyed!. Never before had I heard of such a strange practice that perhaps in the whole world it would be difficult to find another like it. This technique is supposed to have been discovered accidentally in an ancient time, when in one of the processes of leather tanned with liquid tannin, it fell by chance on a vase whose color instantly turned black.<sup>6</sup>

The main tincture, used for the process, is a boil of Nascalote (scientific name *Caesalpinia coraria* Wild), after crushing the plant. After this, the comal is put to dye on a hollow surface, to spray it with the dye. Regarding plants for dyeing, Kojima (2000:336)<sup>6</sup> describes that if Nascalote is not available, it can be replaced by nance (*Byrsonima crassifolia* (L) DC) or quebracho (*Lysiloma* sp) bark, all of which are available in the near the place of elaboration of the ceramics.

It is this sprinkling that gives the black color to the ceramic, characteristic of the pottery production of Guatajiagua. Kojima, who is interested in dyes, carried out the experiment of immersing dishes decorated with the Batik technique in the Nascalote dye. His narration describes that after a day of resting the plates, after having bathed them with the tincture water, and later doing the same with hot water, they change color, revealing the layer of negative that was once wax, “the little plates that finally they were left with a dark background color and with the drawings already without wax in the light color of the original clay, they looked very beautiful due to the harmonic combination of the two natural colors”.<sup>6</sup>

The relevance of the aforementioned process lies in the possibility of mentioning, as a hypothesis (without verification so far by the writer) the negative as a thermal result, a physical-chemical reaction, a process that differs from the hypotheses of various authors<sup>11</sup> focused on seeing the technique as a layer, and not as the bath of the piece.

Of course, this is something to corroborate with the archaeometry,<sup>12</sup> allowing in this way to analyze the type of elements that are in the vessels, their quantity, the elaboration technique,<sup>13</sup> as well as the temperatures at which the pieces were fired. , data to give more body to the analyzes that are made of the ceramic technique of the

negative. A point of view with which the previously affirmed can be complemented is the possibility of replicating this by experimental archaeology, taking as a model the steps described by Kojima<sup>6</sup> in ceramic elaboration.

Another context to analyze, also returning to Kojima,<sup>6</sup> is from the town of Izalco, also in El Salvador. Izaalco's work began in 1999, with the help of Adelina, an informant on whom Kojima<sup>6</sup> relies to carry out his analysis. Like Guatajiagua, already mentioned, Izalco also has an indigenous population, the Pipil people. The Pipil people would be framed, according to Amaroli,<sup>14</sup> as the result of a migration from present-day Mexico to what is called today as San Salvador, which occurred around the 10th and 11th centuries AD.

Once this approximation to the Pipiles has been made, let's move on to the process of elaboration of the jícaras. The previous steps to dye jícaras are basically three: taken from Kojima,<sup>6</sup> who narrates them in accordance with what was told by Adelina, his main informant; The first consists of taking a fruit (it is not clear what type it is), removing the seeds, soaking it in water and removing the peel and then exposing it to the sun, later polishing it with Guaramo leaves (scientific name is *Cecropia SPL*).

Once the aforementioned has been carried out, chicha is prepared (a drink that in South America is used as a ritual element by some indigenous communities, but also responds to a recreational use as it is an artisan liquor based on fermented corn) with soaked grains. and wrapped in banana leaves (plátano, to say it in Spanish from Mexico). After a few days the grains are subjected to a fermentation process, to be used later.

A third moment is the elaboration of a liquid with pods of Nascalote, after which we proceed to spread the chicha (previously prepared), by hand, through the body of the gourd to be dyed. Once this is dry, with the help of the king star, the piece is bathed with the Nascalote tincture, a procedure that is carried out up to 10 times. The idea is that the piece is as black as possible.

After having managed to dye the jícara, it begins to melt beeswax in a vessel, over low heat (we think that as we measure way to avoid burning the material) and at the same time an artisan brush is made: with a piece of wood, for its body, and a piece of cloth, to act as bristles. As a hypothesis we can think that various natural fibers were used in the past, such as those from the corn husk, or even spun cotton. Both elements, corn and cotton, are present in both cultural regions, Western Mexico and South America, in pre-Hispanic times.

With the brush ready and the warm wax they proceeded to make drawings on the surface of the gourd, using the wax as paint. The room was then bathed with the pouring of the chicha and the Nascalote. This process is similar to the one described in the town of Guatajiagua<sup>6</sup> when looking for a total dark pigmentation of the piece to be dyed.

The wax, taken as a hypothetical element when dealing with the negative, fulfills the role of being an insulating layer between the surface to be dyed and the one that is not to be dyed. This is nothing more than making a reservoir, in the ceramic body, for subsequently negativeize the piece.

This process, the last of the operative chain prior to distributing the piece for the market, is carried out by carefully removing the wax with a cloth (possibly using the same one with which the tip of the brush was made) damp with hot water.<sup>6</sup> The veiling of the negative takes time, to avoid detaching both the wax and the dye it is done the next day after having dyed the piece. It is not something to be done lightly, it is patiently repeated as many times as necessary to leave the surface without wax.

## Archaeometric analysis methodology

The data we have, hypothetical up to now, for pre-Hispanic negative pottery basically speak of beeswax and pigments of natural origin,<sup>11</sup> as the basis of their process. Kojima, for his part, in an ethnohistorical context, presents us with slightly clearer guidelines, which guide us towards the search for elements such as the wax itself, as well as dyes, achieved through plants that would be close to the production areas of ceramics.

The scenario presented by ceramics to the negative in terms of its possible relationships between the two populations reference ceramic ions, South America and Western Mexico, is somewhat similar to the debate that from the academy the ceramic production was given to the pre-Hispanic populations that inhabited the current territories of Puerto Hormiga (Colombia) and Valdivia (Ecuador), the latter being. Until now, the pre-Hispanic population with the oldest ceramic production on the continent. For Raymond et al.<sup>13</sup> after carrying out analyzes of pastes, slips, temperatures, and tempering agents, it was possible to conclude that both ceramics came from different traditions, therefore there was no relationship whatsoever.

A similar debate took place in Bucio et al.<sup>15</sup> regarding the thin orange ceramic from Cuitzeo. Techniques such as PIXE (X-ray induced particle emission) and XRD (X-ray diffraction) were used, with which the clay elements could be found at a general and particular level. With these data it was possible to verify the local origins of the raw materials, resulting in a copy of Teotihuacán ceramics. This indicates that the populations of the Cuitzeo area copied the ceramic style of Teotihuacan but used clayey material from the area, in a transmission of knowledge and local adaptation, and possibly also regional, to neighboring areas.

For us, the objective that summons us is could make use of various archaeometric techniques, such as: raman, micro raman, scanning electron microscope, PIXE (X-ray induced particle emission), XRD (X-ray diffraction), TSM (Thin section microscopy), fluorescence of X-rays, X-rays, Mössbauer spectroscopy and lastly neutron activation. Next, we proceed to explain its functionality for our purposes.

### Micro raman

It is a technique that uses laser beams to measure, in situ, the chemical and structural compositions of various samples, among which the possibility of working with ceramic fragments stands out for our context. Among its advantages would be that it does not damage the piece, and it does not require preparation. Which makes it less complicated when compared to techniques that require material processing, such as neutron activation and X-ray diffraction.

### Scanning electron microscope

The technique allows to look at the elemental composition, as well as the surface of the pieces, which would highlight the manufacturing and technological elements. It can be done at the ININ, in the case of Mexico. Another important point, which somewhat complements what Tenorio<sup>16</sup> said, is the possibility of analyzing pigments (Camacho et al. 2005: 170-171), something to be done by calibrating the penetration on the surface.

### PIXE (X-ray induced particle emission), XRD (X-ray diffraction) and TSM (thin section microscopy)

These two techniques are complementary to each other. Yes, and they are used to look at mineral compositions, present in clay, at different scales. One of its peculiarities is that the state of the sample

changes, which makes it necessary for them to be carried out once other non-destructive analyzes have been carried out. Returning to Bucio et al.<sup>15</sup> we can say the following, X-ray diffraction (XRD), is used to determine the composition of the minerals present and the general composition of the pastes; Proton-induced X-ray emission (PIXE) is used to determine the composition of trace elements and elements of very similar compositions. A little later there is talk of the need to take a small piece of sample and pulverize it to homogenize the sample, a sample that is first analyzed by means of XRD and later PIXE.

Returning to the analyzes made by the Dr. Tenorio about PIXE, we can think that a possible answer for the analysis to the negative surface is to better calibrate the incidence of the ray on the surface, says Tenorio:

According to the value of the energy of the krypton ions, they penetrate the ceramic 7um approximately, so the path of these ions does not penetrates into the clay but only into the slip (...)<sup>16</sup>

Given the technical quality of this analytical tool, a particle accelerator is required, which makes it necessary to carry it out at the Institute of Physics of the Autonomous University of Mexico, UNAM. A complement to these analyzes is the method of thin sections, with which the mineral composition and the nature of the tempera can be determined employee. Wagner et al.<sup>17</sup> exposes his valuable contribution to classify ceramic pastes, through the readings of combustion processes.

### X-ray fluorescence

It is a non-invasive technique, which causes zero damage to the material and provides data on the composition. In the case of ceramics, it provides knowledge about the types of pigments present in the material. Another advantage is that it can be used with little material, which helps if you do not have large samples for testing.

### X-rays

X-rays provide an inspection of surface materials, mainly presence or absence of minerals such as feldgrass;<sup>17</sup> Another look that this analysis technique also offers is the ceramic production method, which is done by reading the horizontal or vertical distribution patterns. Raymond et al.<sup>13</sup> carried out studies with Early Valdivia pieces, to see their elaboration.

### Mössbauer spectroscopy

Returning to Ghezzi,<sup>18</sup> and Wagner et al.,<sup>17</sup> this technique provides measurement parameters focused on the presence or absence of iron levels, which indicates firing temperatures, giving the possibility of providing the type of atmosphere in which a piece was fired. Cabral,<sup>12</sup> brings the possibility of the technique to go further in the composition materials, being something to look at sources and raw material banks.

### Neutron activation

This analysis would be the last to be done, basically because it leaves the analyzed sample radioactive, and also because it is required to pulverize it. Almost that can be done after PIXE and XRD. His contribution would be an elaboration of a compositional matrix on a much larger scale, Wagner et al.<sup>17</sup> is emphatic in his contribution: it would help to verify if a material is of local origin, or not, which implies knowledge about the compositions of local materials. It is worth saying that it is highly technological, since a nuclear reactor is required. It is feasible to do it at the ININ.

The idea, following the order of the exhibition, would consist of taking negative ceramic materials with an established archaeological context, both from Mexico and South America, that is, a controlled context. The controlled context it will make it possible to establish the physicochemical nature of the samples, linked to the type of geological medium for extracting the clays and the added plastic inclusions (if any in the clayey matrix).<sup>19-21</sup>

## Conclusion

The geological analysis, which will allow us to indicate the origins of the raw material used, will be complemented by the investigation of manufacturing processes, which it will be possible to reach through physical-chemical inspection of cooking patterns, temperatures, type of kneading, as well as the elements used both for varnishes and decoration. An element to highlight, consolidating the aforementioned, is that if there is a link between both decorative traditions, visible features should be shared in aspects of ceramic production, such as: temperatures, kneading techniques, ingredients for decoration (re appropriate to the offer of the medium); It will seem obvious to affirm that if there was a relationship between both ceramic productions we could speak of a technical journey.

## Acknowledgments

None.

## Conflicts of interests

Author declares there are no conflicts of interests.

## Funding

None.

## References

1. Oliveros, Morales, Jose Arturo. Tomb makers in El Opeño, Jacona, Michoacán. Mexico: The College of Michoacán, AC, City Council of Jacona Secretary of Culture, Conaculta; 2009.
2. Jimenez Salas OH. Raw material and pre-Hispanic ceramics. Pottery production in ancient Mexico, Beatriz Leonor Merino Carrión and Ángel García Cook (coord.), Institute of Anthropology and History, Mexico; 2005:23–53.
3. Appadurai A. Introduction: merchandise and the politics of value. In: Arjun Appadurai, editor. *The Social Life of Things*. Grijalbo, Mexico. 1991:17–87.
4. Munoz A. Piedras Negras Ceramics, Guatemala, Family. 2004.
5. Aguilar Irepan F. Prestige goods and ritual economy in the Tarascan state. Master's Thesis in Archaeology, El Colegio de Michoacán, AC, La Piedad; 2013.
6. Kojima Hideo. Black-stained pottery from a Lenca village. In: Ohi Kuniaki, editor. *Chalchuapa final memory of the interdisciplinary investigations of El Salvador*. Japan: University of Foreign Studies. 2000:333–337.
7. Alvarado HH. And did they come from the sea? The contacts between South America and the West of Mexico: balances and perspectives around an old problem. In *Archaeological research in Michoacán advances, problems and perspectives*, Claudia EC (editor), Mexico: El Colegio de Michoacán, AC. 2014:367–402.
8. Filini Agapi, Colin McEwan. Pre-Columbian art at the Benaki Museum. Mexico: Ministry of Foreign Relations. 2009.
9. Krickeberg Walter. *The ancient Mexican cultures*. Mexico: Economic Culture Fund. 2003.

10. Larco Hoyle Raphael. Lemus s/f Some Pipil ceramic groups from El Salvador. Geneva Switzerland: Nagel Editions. Peru. 1966.
11. Filini Agapi. Of mud and fire. The ceramic traditions of Michoacán South America and the West. In: Claudia EC, editor. Archaeological research in Michoacán advances, problems and perspectives. Mexico: El Colegio de Michoacán, AC; 2014:215–233.
12. Cabral PA. Archaeometry of ceramics and obsidians with Mössbauer spectroscopy. In: Archaeometry, Esparza L, Cárdenas GE, editors. Mexico: Colegio de Michoacán, AC; 2005:109–135.
13. Raymond. A comparison of early ceramic technologies in Ecuador and Colombia. Technology and organization of pre-Hispanic ceramic production in the Andes, edited by Izumi Shimada. Pontifical Catholic University of Peru; 1994:33–52.
14. Amaroli P. Some Pipil ceramic groups from El Salvador. 1992.
15. Bucio. Pixe studies and X-ray diffraction in ceramics from the Cuitzeo basin. In: Archaeometry, Esparza L, Cárdenas GE, editors. Mexico: Colegio de Michoacán, AC; 2005:23–41.
16. Tenorio, Dolores C. Analysis of archaeological pieces with the PIXE technique. In: Archaeometry, Esparza L, Cárdenas GE, editors. Mexico: Colegio de Michoacán AC; 2005:43–54.
17. Wagner. Firing conditions and compositional characterization of formative ceramics, archeometric perspective. In: Technology and organization of pre-Hispanic ceramic production in the Andes, Izumi S, editors. Peru: Catholic University of Peru; 1994:121–156.
18. Ghezzi Ivan. Compositional analysis in the study of the production and distribution of pre-Hispanic ceramics. *Bulletin de l'Institut Français d'Études Andines*. 2011;40(1):1–29.
19. Camacho A. Analysis of archaeological materials through scanning electron microscopy In archaeometry, Esparza L, Cárdenas GE, editors. Mexico: Colegio de Michoacán, AC; 2005:167–179.
20. Black-stained pottery from a Lenca village. In Chalchuapa final memory of the interdisciplinary investigations of El Salvador, Ohi Kuniaki, editor. Japan: University of Foreign Studies; 2000:339–346.
21. Marcos George G. The neolithic process in the equatorial Andes. In History of Andean America, Vol (1) Aboriginal societies Luis GL, editor. Quito, Ecuador: Simón Bolívar Andean University; 1999:109–140.