Plastilina or Plasticine: Study of an unpublished sculpture by Ismael Smith in the context of industrial modeling pastes invented during the late 19th century.

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Abstract

With the second industrial revolution (1870-1914), materials typically used in the making of art underwent a substantial transformation in order to meet new expectations that would fulfill the needs of the artist. In sculpture, traditionally, softer materials such as clay or wax would be used for producing the original models by the artist, that would then be transferred into a more solid material, such as stone. In Europe, during the period of 1879 and 1897, modeling pastes with similar characteristics but different formulations were developed to create a more advantageous material to produce sculpture models.

The sculpture models made in clay were inconvenient in that once the clay would dry the artist could not make modifications to the model. Using wax also proved problematic, as it does not resist high temperatures very well and also lacks ductility. By the mid 19th century there are records of recipes that were being developed to modify waxes in order to impart more ductile proprieties. These hand-mixed, homemade formulas came to be known as modern modeling materials. However, it is not until the end of the 19th century that modeling pastes were being developed in a more industrial manner.

The materials used to form these original positive models were often recycled and repurposed for other sculptures after being cast in plaster or transferred directly to another more durable material. Therefore, it is very rare that they would have been preserved. However, some do survive, such as the collection at the Rodin Museum in Paris. These extant original positive models are so important because they are often the only pieces produced that were made directly by the artist's hands. They often still have the artist's fingerprints and can give clues into the artist's creative process. After being modeled, these models were often taken by others to be transferred into plaster, stone, metal, etc., with some possible final intervention of the artist. In these instances, one can note the changes from these original models to the final sculpture. Even rarer, some works only exist as these original positive models.

By the beginning of the 20th century, Ismael Smith produced a model made entirely with one of these new industrialized modeling pastes. The aim of this study is to analyze and identify the compounds present in the modeling paste of one of Ismael Smith's sculptures to determine if it matches the formulations of modeling pastes invented in the late 19th century, known as plastilina, plastiline, or plasticine. The identification of the material and its properties will help determine the requirements for developing a conservation treatment protocol for the artwork.

Introduction

This poster will shortly resume the historical research about the various industrial modeling clays produced in the late 19th century, obtained from chemical formulas, sculpture manuals, artistic magazines, books dedicated to sculpting techniques and processes, and articles about scientific research and restoration procedures for works made with this material. We will include as well the observations made about the Ismael Smith sculpture appearance and the results obtained from the laboratory analysis performed by the MNAC.

Several types of industrial modeling clays developed in different regions of Europe in the late 19th century. Their goal was to produce modeling materials with characteristics similar to both wax and clay. Creators sought to achieve a stiff clay that would not completely harden over time or upon exposure to air, and that would be resistant to water and heat.

In order to obtain precise information on the composition and substance distribution, micrometric fragments and cross-sections of the modeling paste have been analyzed by micro-infrared spectroscopy (μ-FTIR), combined with scanning electron microscopy with energy dispersive x-ray spectroscopy, SEM-EDS, and Optical Microscopy, OM in the laboratory of Museu Nacional d'Art de Catalunya.

Optical images were obtained with a Reichert-Jung POLYVAR MET Optical Microscope in reflexion mode (dark field, bright field and polarized light and 50x to 1000x magnification). Samples were carbon-coated to ensure the necessary electrical conductivity for SEM imaging. Secondary electron images and backscattering, BSE, images were obtained with acceleration voltages between 10 kV and 20 kV by FESEM (Jeol J-7100). μ-FTIR (SPOTLIGHT 100/Frontier PerkinElmer, MCT detector, 600 -4000 cm-1) spectra were produced in transmission mode from 100×100 μm areas of the samples prepared using a diamond cell.

Plastilina, Plastiline, and Plasticine

History

Photo from Wikipedia.

A

The first known patent for modeling clay was produced in Germany in 1880 by Franz Kolb, under the name Kunst-Modellierton. There is limited information on the commercialization and production of this specific modeling clay, and its composition remains unknown. However, an article published by Friedrich Giesel in the scientific journal Chemistry Europe in 1878 provides an initial idea of the materials used for the production of this type of clay.

Giesel referred to this product as Plastilina, which later became associated with the German variety of modeling clay.

B

During the same period in Italy, in 1879, Luigi Giudice produced a modeling clay that he called Plastilina in singular or Plastiline in plural. These two denominations became the most well-known for Italian modeling clay. Having two different terminations made it difficult to differentiate between the Italian and German modeling clays.

Photo from Recta Galleria d'Arte.

C

Later, around 1897, William Harbutt patented Plasticine with a different composition. It is primarily composed of paraffin as the fatty agent and calcium carbonate, which acts as the main filler. The described ingredients are verified in analyses conducted on Auguste Rodin's models, who extensively used this modeling clay for his sketches, (BLUZAT, Hélène, CASCIO, Agnès, MARY, Guylaine, et.al. « Étude historique et scientifique des pâtes à modeler ; la conservation-restauration de deux bustes d'Auguste Rodin ». This variety of modeling clay became the most commercialized in various settings, such as educational environments or for the production of animation films. It will have less greasy characteristics than Plastilina or Plastiline, and the production cost will be lower than that of other modeling clays, likely due to the replacement of the fatty agent with a petroleum derivative.

Photo from V&A Museum.

Composition

Analyses and experiments by Giesel. (Germany)

40% zinc oleate
23% flowers of sulphur
18% wax and oil
15% China clay

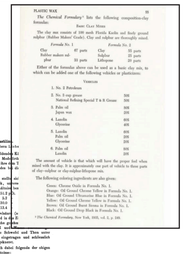
[G. Eggert, Beiträge, 2016]

Named Tschudi's plastiline but Invented by Luigi Giudice (Italy)

Lanoline and glycerin
Native sulphur
kaolin

[P. Moins, Les Maîtres de la Pâte, Paris, 2001] [Langlois *et al.*, Studies in Conservation, 2016]

The original composition of Italian and German modelling clays are similar



Analyses of Auguste Rodin's models

1
Beeswax and starch

2
Zinc oleate
Native sulphur
Mineral filler

3
Paraffin
Fatty mater
Calcium carbonate

[Langlois *et al.*, Studies in Conservation, 2016] [Cotte *et al.* Technart 2015, O-77]

To acces the Bibliography:

Ismael Smith; Study of the sculpture made in Plastilina "Busto de Don Quijote" (1927-1932)

Portrait of Ismael Smith by Ramon Casas y Carbó, from MAPFRE Foundation.

Introduction:

Ismael Smith (1886-1972) was a Catalan-American sculptor, primarily known in the Noucentista movement for his drawings and engravings with expressionist stylistic tendencies. He studied at the Llotja School in Barcelona in 1903 and between 1910 and 1914 he studied at the National School of Decorative Arts in Paris, thanks to a scholarship from the City of Barcelona. He suddenly left Spain when the First World War started, leaving most of his work behind. He often traveled between Barcelona and New York until 1919 when he permanently settled in the United States, after which his artistic production gradually stopped.

Between 1926 and 1931, Ismael Smith made one last trip to Spain and attempted to win the competition for the creation of a monumental sculpture of Christ for the Sagrada Familia in Barcelona, a period during which he apparently created the sculpture in Plasticine of the "Bust of Don Quixote" that nowadays is kept in the National Museum of Catalonia.

Following numerous public disturbances, in 1962, Ismael Smith was placed in the Bloomingdale psychiatric hospital in New York. In 1972 he was 76 years old, when he died at this same hospital. While institutionalized, he resumed some of his sculpting activities and created sculptures in modeling clay and raw clay.

The Sculpture "Busto de Don Quijote" (1927-1932):

The sculpture was found in very poor condition. It was disintegrated into several pieces of various sizes, especially on the parts where nails were added. There were cracks on certain areas, probably due to material shrinkage. The interior of the modeling clay showed a greenish coloration, and sulfur flowers have crystallized on the surface, both inside the clay and on top of the varnished surface. The presence of sulfur creates a very characteristic odor and poses storage problems due to sulfur migration onto the storage material.

The metallic elements of the sculpture, which are in direct contact with the modeling clay, showed signs of oxidation, especially significant on the large metal piece found in the head, which is causing numerous cracks in the head and could potentially disintegrate this part into many pieces.

In conclusion, the disintegration into numerous pieces could be somewhat related to the inclusion of metal nails, as well as to the aging of the material, which has a tendency to shrink. Additionally, the presence of sulfur flowers crystallizing on the surface of the piece may pose storage problems and alter the external appearance of the piece. The exterior of the piece did not show very significant dust deposits, likely due to the application of the exterior varnish. The clay has retained its plasticity and we observed that it is still malleable, which can hinder its restoration intervention and make its transportation extremely delicate.

Dry fit and photo montage of the multiple parts of the sculpture to observe the original position of the fragments previous to performing the consolidation. MNAC ©

Image of the fragments of the sculpture. MNAC ©

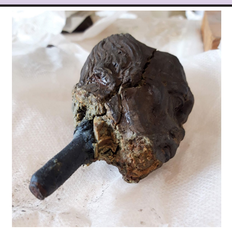
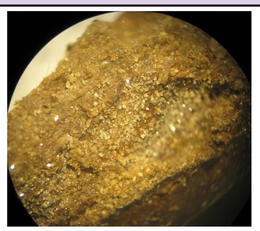
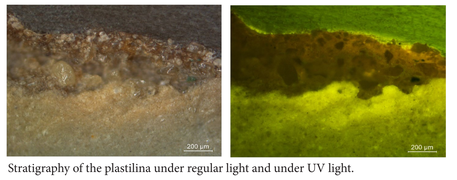


Image of the head of the Sculpture. Detail of the inserted metallic pin element in the head that is having a chemical interaction with the Plastiline material. MNAC ©



Photography x20 of the interior of the Sculpture. Sulphur chrystallizations can be observed in this image. MNAC ©

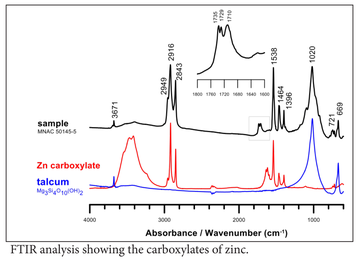
Analysis results



Stratigraphy of the plastilina under regular light and under UV light.

Cross-section of a sample from the sculpture under optical microscope, by reflection (left: dark field; right: UV light).

The yellowish fluorescence of the inner layer is associated with compounds from the fatty material identified in the modeling clay. The pink fluorescence of the surface layer is associated with a shellac coating. Oxalates are detected above this surface layer.

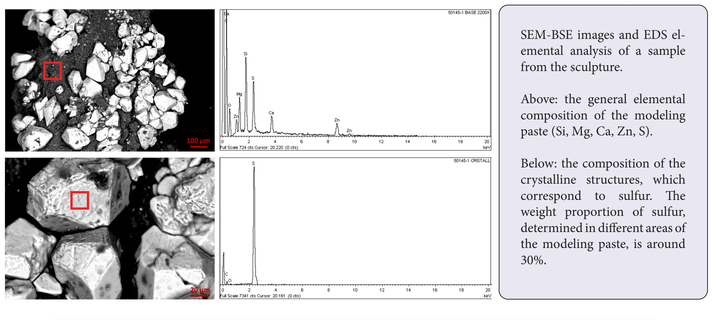


FTIR analysis showing the carboxylates of zinc.

μFTIR spectrum of a sample from the interior of the sculpture's modeling clay compared with reference spectra of zinc carboxylates and the inorganic filler talc.

The three bands at 1735, 1729 and 1710 cm-1 in the carbonyl vibration region are consistent with the presence of two types of fatty substances in the modeling paste: drying and non-drying fatty acids.

Analyses and scientific images by © Museu Nacional d'Art de Catalunya, 2024



SEM-BSE images and EDS elemental analysis of a sample from the sculpture.

Above: the general elemental composition of the modeling paste (Si, Mg, Ca, Zn, S).

Below: the composition of the crystalline structures, which correspond to sulfur. The weight proportion of sulfur, determined in different areas of the modeling paste, is around 30%.

Conclusion

The primary composition of the modeling clay in Ismael Smith's sculpture is zinc carboxylates, native sulfur, and a mineral filler. This composition is similar to modeling pastes developed in Germany and Italy in the late 19th century and used in the early 20th century, including in some of Rodin's models.

Smith's manipulation of this modeling paste, introducing metallic elements and applying a surface coating resembling varnish, has affected the current conservation state of the sculpture, leading to the formation of chemical reaction products. These initial results require further analysis to design an optimal restoration intervention.