

CLASSIFICATION OF THE TYPOLOGIES, TECHNIQUES AND MATERIALS OF THE APPLIED BROCADES OF THE ALTARPIECES OF GIPUZKOA BY MEANS OF THE ANALYTICAL TECHNIQUES OF LABORATORY

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ABSTRACT

The applied brocade is a relief painting technique that reproduces the gold or silver threads of the textile brocades outside the artwork and then is placed onto it with the final result of a large decorated surface. It had its origin in Central Europe and spread to Southern Europe reaching France, Portugal and Spain, being widely used from the mid-15th century to the mid-16th century.

The scattered documentation, the lack of systematic and conclusive researches, the poor conservation state of this technique and the finding of more examples in Northern Spain has lead us to the study and classification of an important number of applied brocades located in six altarpieces of the Basque region of Gipuzkoa, Spain.

An extended protocol of analysis has been created to obtain a complete understanding from the overall to the detail of the different types of applied brocades employed in the altarpieces. This protocol has comprised an in situ study and an analytical study. Due to the permanent location of the altarpieces in the churches the removal of paint samples has been necessary. To avoid a massive sampling and therefore minimize the damage caused to the artwork a selected sampling process has been carried out. This has been achieved through the information provided by the created data sheets in the in situ study and the maxim of obtaining the most information that each sample embedded in resin (cross-section) can provide by optimizing the possibilities that the available analytical instrumentation can yield during the analytical study. The techniques of laboratory used include: Optical Microscopy (normal and ultraviolet light), Cross-section Staining Tests, Scanning Electron Microscopy (SEM) (high and low vacuum) and Raman. Other possible techniques to be used are: Fourier Transform Infrared (FTIR) Spectroscopy in reflection mode, Matrix Assisted Laser Desorption/Ionization (MALDI) and Coherent Anti-Stokes Raman Scattering (CARS) Microscopy.

The paper will focus on the presentation of the obtained results through a thorough classification of the typologies, techniques and materials of the studied applied brocades. This will be compared with treatises and ancient recipes as well as other relevant studies to verify and complete what has been already documented. All this corpus of information will improve our knowledge of the production process of the ancient painting technique of the applied brocade and will assist with the spreading routes, the workshops and the conservation treatments.

CURRENT STATE OF THE ISSUE

After some years of study, we can state that there is an important lack of knowledge of the technique of the applied brocade, mainly because of the limited publications on the subject. This fact together with the poor conservation state of the applied brocades, often covered with restoration, result in the non-identification of the technique and consequently in inappropriate or non-existent conservation treatments.

Based on the compiled and checked bibliographical references it is clear that the applied brocade has been more studied and published in the rest of Europe than in Spain. This is observed in the treatises and the recent specialized publications. In the specific case of Spain, most of these studies are non-published. These data lead us to the conclusion that there is not any detailed research to date which leaves many gaps in many fields. The finding in Spain of

more altarpieces decorated with applied brocade motifs confirms the need to establish a corpus of technical information regarding applied brocades.

In accordance with the treatises and other modern relevant publications different reproductions of applied brocades have been carried out. These practices have helped in the understanding of the process that the old masters followed in the elaboration of the motifs of the applied brocades.

The process of execution of the technique can be summarized in the following eight stages:

1. Engraving of what will be used as the mould.
2. Placing of the tin leaf on top of the mould.
3. Pressing the tin leaf into the mould.
4. Filling of the tin leaf with a semi-liquid material.
5. Lifting of the filled tin leaf from the mould.
6. Cutting of the brocade motifs.
7. Adhesion of the brocades onto the surface of the artwork.
8. Gilding and painting of the applied brocades (optional).

GOALS OF THE INVESTIGATION

The main goal of the research is the technical research of the applied brocades of the altarpieces (made of wood) located in the Basque province of Gipuzkoa. This region as well as others from Northern Spain has an important number of artworks with applied brocade dated to the end of the 15th century and the first decades of the 16th century. The interest in depicting brocades in this period is attributed to the intense trade between Spain and Central Europe when Flemish painting practice and techniques related to applied brocades were introduced. Therefore, the altarpieces that have been studied date from the 1500 to the late 1530s corresponding to the Late-Gothic and First-Renaissance periods. This period of time fits with the time when the technique of the applied brocade was more extensively used.

Specifically, in Gipuzkoa there are documented to be six altarpieces with applied brocade motifs. They cover the entire geographical area of the province of Gipuzkoa. The six altarpieces are the following: the Triptych of la Asunción-Coronación de la Virgen in the Church of La Asunción de Santa María, Rentería (1505-1510); the Triptych of San Antón in the Church of San Pedro, Zumaya (1510-1515); the Altarpiece of La Piedad in the Church of San Miguel, Oñate (1535-1537); the Altarpiece of San Juan Bautista in the Church of San Miguel, Oñate (c.1534-1566); the Altarpiece of La Santísima Trinidad in the Monastery of Bidaurreta, Oñate (1531-1533); and the Altarpiece of San Miguel in the Church of Alzaga, Alzaga (c.1534-1550).

The analyses of the different applied brocades collected from the six above mentioned altarpieces have resulted in a thorough classification of typologies, techniques and materials. This corpus of information will help the conservators to recognize and deal with the new found applied brocades and eventually to come up with more adequate conservation treatments. It will also be useful for other disciplines, like Art History, Conservation Science and Artistic Painting and it will can lead to more specific future researches.



Triptych of San Antón



Altarpiece of San Juan Bautista



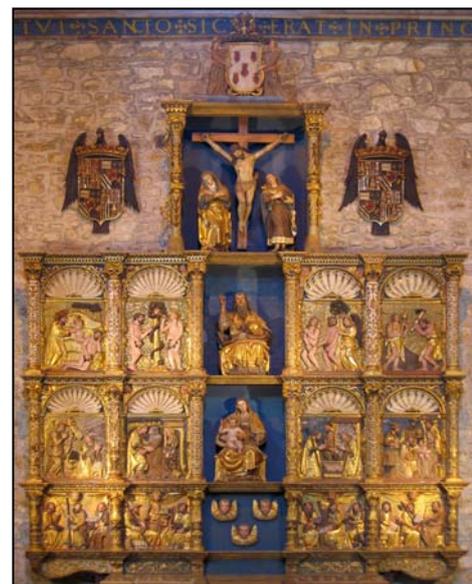
Altarpiece of San Miguel



Altarpiece of La Piedad



Triptych of La Asunción-Coronación de la Virgen



Altarpiece of La Santísima Trinidad

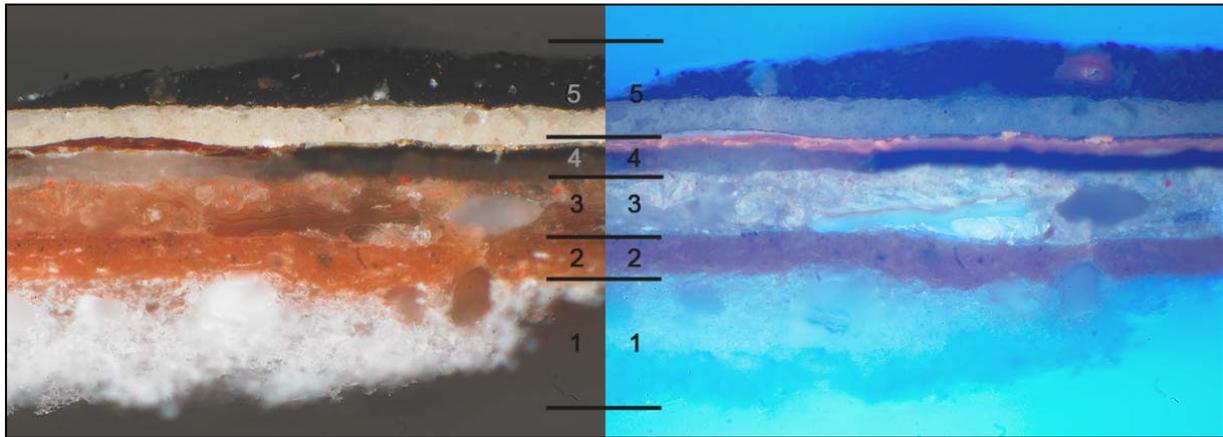
PROTOCOL OF STUDY

Throughout the developed research the protocol of study was found out to be the main tool to approach a wide and thorough study of the painting technique of the applied brocade in the altarpieces of Gipuzkoa. The first goal of the protocol was to start with the overall study of the altarpieces and to conclude with a classification of the typologies, techniques and materials of all the varieties of applied brocades used in the altarpieces.

The protocol began with the in situ study carried out in the locations of the altarpieces; the churches. In the overall analysis of the altarpiece were filled in the created data sheets that included: the altarpiece data sheet, the location of the applied brocades data sheet and the applied brocade data sheet. The altarpiece and the applied brocade data sheets were divided in three sections: the study of the techniques, the study of the materials and the study of the state of conservation. The location of the applied brocades data sheet was the classification of all the different types of applied brocades found within the altarpiece. This classification was necessary for an accurate sampling process that on one hand would be representative of all the thematic and technical varieties of the applied brocades and on the other hand would avoid a massive and unnecessary sampling. In the in detail analysis was carried out the sampling of the applied brocades. The gathered data was completed with overall and detail digital colour pictures and line-drawings processed with Adobe Photoshop CS3.

Following the in situ study was the analytical study. It is very important to stand out that the analytical work in this research consisted in maximizing information from each cross-sectioned sample. Bearing in mind this statement, the protocol followed for the analysis of the sampled applied brocades was divided in two sections: the analysis of the execution techniques and the analysis of the materials. The first section started with the selection and preparation (in resin) of the painting samples and finished with the study and photograph of the cross-sections under the optical microscope. The second and last section of the analytical study comprised a very thorough and methodical system of processing the analytical results. Firstly, the cross-sections were analyzed under the SEM/EDX in low vacuum mode for the identification of the inorganic materials. Secondly, the cross-sections were stained with two stains for the identification and location of the organic materials within each sample; Amido Black 2 stain was used for the identification of proteins and Rhodamine B stain for the identification of lipids. Thirdly, in order to obtain a more detailed identification of the inorganic materials Raman Spectroscopy and SEM/EDX in high vacuum mode were used. Some techniques that are still being used for a more accurate identification of the organic materials are Fourier Transform Infrared (FTIR) Spectroscopy in reflection mode, Matrix Assisted Laser Desorption/Ionization (MALDI) and Coherent Anti-Stokes Raman Scattering (CARS) Microscopy.

All the obtained analytical results were classified in accordance with the characteristic layer structure of the applied brocade: the ground, the imprimatura, the filling mass, the metallic leafs (including the tin and the gold leafs) together with the adhesive (between the tin and the gold leafs) and finally, the opaque paint or glaze. Within each of these five groups were studied the differences between the typologies of the applied brocades and their location within the artwork.



*Cross-section from the altarpiece of La Santísima Trinidad showing the characteristic layering of an applied brocade: (left) in normal light; and (right) in UV light. The numbers correspond to the layer structure: 1 ground; 2 imprimatura; 3 filling mass; 4 tin leaf, adhesive and gold leaf; 5 opaque paint (2 layers).
Image width: 160 μ m.*

ANALYTICAL RESULTS

Beginning with the grounds, in most of the cases a coarse and thick ground layer in the bottom (yeso grueso) and a fine and thin ground layer on the top (yeso fino) were found. In some cases both layers were applied in several layers sealed with glue and in some other cases they were applied in a unique layer. The most common composition of the ground was calcium sulphate, except for one altarpiece (the triptych located in Rentería) where calcium carbonate was used. The staining revealed glue as the binding medium in the ground. Not always the yeso fino was sealed with a glue layer and instead an oil layer was observed by staining. Calcium carbonate and oil sealing were found in the triptych of Rentería that is documented to come from Central Europe and that is the eldest of the six studied altarpieces.

The imprimatura between the ground and the applied brocade differed depending on whether it is a juxtaposed applied brocade (a square or rectangular pattern repeated side-by-side covering a large surface) or an isolated applied brocade (a pattern combined in an arbitrary way on a surface with identical or different patterns).

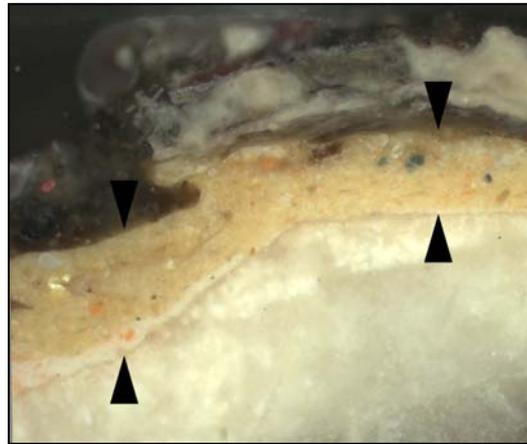


Juxtaposed applied brocades on the background and the vestment of the seated figure. Triptych of San Antón.



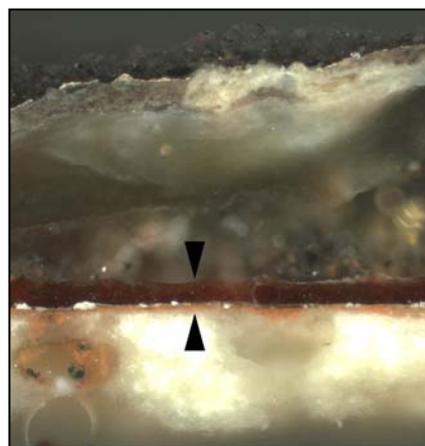
Isolated applied brocades on the robe of a figure. Altarpiece of La Piedad.

The juxtaposed applied brocades were applied on top of one or two colour layers. These layers were white, orange or earth coloured. The SEM/EDX in combination with Raman revealed different pigments being the most common ones lead white and earth pigments. Particles of organic red and orange dyes were also found as well as soda-lime glass particles. The staining showed a mixture of oil and a proteinaceous material like the more usual binding medium.



Cross-section from a juxtaposed applied brocade of the triptych of La Asunción-Coronación de la Virgen. The lower (white colour) and the upper (earth colour) layers of the imprimatura are indicated between pairs of arrows. Image width: 425 μ m.

The isolated applied brocades were very often applied over glazes composed of organic red or copper-based green bound in an oil and proteinaceous medium. These glazes were applied on top of silver leaf. Beneath the silver an orange colour bole made up of earth pigments in glue was identified.



Cross-section from an isolated applied brocade of the triptych of La Asunción-Coronación de la Virgen. The bole (lower layer), the silver leaf (middle layer) and the organic red (upper layer) of the imprimatura are indicated between pair of arrows. Image width: 420 μ m.

The filling materials -employed for keeping the relief of the patterns- that were characterized were thirteen: 1. oil and a proteinaceous material; 2. oil and a proteinaceous material with few and small inclusions of lead white, vermilion, azurite and iron red oxide; 3. beeswax with few and small inclusions of red lead and sometimes red fibres; 4. glue and possibly aluminium (the latter was identified by SEM/EDX, but it needs to be confirmed by further studies); 5. lead white, red lead and iron red oxide bound in oil and a proteinaceous material; 6. calcium sulphate in oil and a proteinaceous material; 7. calcium sulphate and calcium carbonate bound

in oil and a proteinaceous material; 8. calcium sulphate, earth pigments, vermilion and organic red in oil and a proteinaceous material; 9. calcium sulphate and glue; 10. calcium sulphate and lead white bound in oil and a proteinaceous material; 11. glue with some calcium sulphate and earth pigments; 12. glue and few lead white particles and 13. glue.

Calcium sulphate mixtures were the most common and were identified in four of the six altarpieces.

The predominant binding medium of these mixtures was oil with a proteinaceous material. The second more common medium was glue. Some of these mixtures were applied in a unique filling layer, others in combination with another mixture of different composition resulting in a two-layer filling and a last group was applied alone or combined.

The fillings made up of just one layer were mainly mixtures of the organic binding medium with some inorganic inclusions. The fillings made up of two layers were, as found in two altarpieces (the one located in Alzaga and the altarpiece of La Santísima Trinidad), a calcium sulphate-rich layer on top of a glue-rich layer or, as found in just one altarpiece (the triptych of Zumaya), a lead-rich layer on top of a calcium sulphate-rich layer. In one altarpiece (the one in Alzaga) was found an oil beeswax-looking layer with red lead inclusions on top of a glue layer.

The layering of the metallic leafs that covered the filling commonly consisted of (from bottom to top) tin leaf, an adhesive composed of oil in the bottom and a proteinaceous material on the top and gold leaf. Very few samples revealed a more complex structure made up of five layers: 1. tin leaf; 2. oil; 3. lead white with particles of vermilion, iron red oxide and carbon black bound in a mixture of oil and a proteinaceous material; 4. oil (not always present) and 5. gold leaf.



Cross-section of the triptych of San Antón showing (from bottom to top) the tin leaf, the oil layer, the paint layer with multiple inclusions, the oil layer and the gold leaf (the last two layers are not visible because of their extreme thinness). These layers are indicated between pairs of arrows. Image width: 130 μ m.

The opaque paints and glazes covered a wide variety of colours. The opaque paints showed azurite for the blue; earth pigments and organic red for the orange and the red; carbon black for the black and lead white for the white. Staining tests revealed that the most usual binding medium was a mixture of oil and a proteinaceous material or only a proteinaceous material. The glazes showed an organic red dye for the reds and a copper-based green for the greens. The medium was either oil or a proteinaceous material. In either the opaque paints or the glazes big particles were used to completely cover the shiny colour of the gold underneath and thus, stood out the raised gilded threads of the brocade pattern.

The study of the cross-sections under the optical microscope with ultraviolet light confirmed that originally the applied brocades were not covered with any kind of protection layer. This statement was mainly supported by the analyzed samples of one altarpiece (the one located in

Zumaya) that was never restored. These samples showed no traces of varnish. In accordance with this a non-original varnish layer was identified in the restored altarpieces: on top of non-original paint covering the original layers of the applied brocade; on top of the lower layers and in the cracks of the applied brocade; and on top of a layer of dust.

COMPARISON WITH DOCUMENTARY SOURCES: FIRST APPROACHES

Many aspects of the material composition of the applied brocades confirmed them as painting techniques executed in the beginnings of the 16th century: the use of very specific colour pigments and dyes for either colouring the layer or speeding up the drying of the layer -these specific identified pigments were: calcium sulphate, calcium carbonate, lead white, earth pigments, vermilion, red lead, organic orange dyes, organic red dyes, azurite, copper-based green and carbon black-; the use of metallic leafs such as gold and tin; and the predominance of oil and a proteinaceous material as the binding medium sometimes combined with oil-based and protein-based layers. This specific use of the binding media was observed in several 15th and 16th century Italian and Spanish paintings. The Renaissance was the period of transition in binding media. In 15th century Italy, oil began to be used in combination with egg tempera and by the 16th century oil was widely used, resulting in paintings with a layering system of egg tempera and oil. It is very possible that this technique migrated from Italy to Spain.

A first study of the obtained analytical results revealed some findings not reported in documentary sources. Some of these data contradicts with what some scholars think. These aspects included: the adhesion of the gold leaf to the tin leaf with a three-layer adhesive made up of an oil layer, a particle-rich colour layer in a mixture of oil and a proteinaceous material and a final oil layer; and the location of isolated applied brocades on backgrounds and not only on vestments.

IMPORTANT OBSERVATIONS

Bearing in mind the analytical results and other gathered information some important observations can be highlighted.

The two eldest altarpieces that are triptychs (located in Rentería and Zumaya, dated between 1505 and 1515) placed by the Cantabric Sea coast are the only ones that present juxtaposed and isolated brocades on backgrounds and vestments. Furthermore, one of these triptychs (the one located in Zumaya) is the one that contains the largest variety of layerings and materials. Therefore, the more variety and complexity in the execution techniques, the materials, the patterns and their location might indicate an older execution date.

By the end of the 15th century and the beginning of the 16th century, altarpieces (some of them commissioned by families with purchasing power) arrived by boat at the Cantabric port of Bilbao in the Basque province of Bizkaia situated in the West side of Gipuzkoa. This might point out to a Central European origin of the two eldest altarpieces that are the only ones (among the six studied altarpieces) located by the coast. This hypothesis is supported by the finding of strong similarities between the preparatory layers of 15th century Flemish painting and the ones identified beneath the applied brocades of the triptych of Rentería. Both show a one-layer ground of calcium carbonate (calcium carbonate grounds were more common in Central European artworks than in Southern European) in animal glue sealed with an oil-resin layer (only oil was detected by staining in the triptych of Rentería. More analyses need to be done on this very thin layer to obtain an accurate identification of its composition). On top of the ground a white lead or white lead-rich layer with other colour inclusions was applied

acting as the imprimatura. The triptych of Zumaya does not show these similarities or others which strongly rejects the possibility of its importation from Central Europe. Instead, foreign artists settled in the Basque coast could have been the authors of the triptych.

Like many scholars believe, it is very likely that the technique of the applied brocade migrated from the coast to the interior of the Basque Country and so did the foreign artists leading to later and different types of applied brocades. This is probably the case of the four altarpieces located in the interior part of Gipuzkoa. On the basis of the complexity of the technique, the variety of patterns and their location these four altarpieces can be classified in two different groups. The first group includes the altarpiece of La Santísima Trinidad, Oñate and the altarpiece located in Alzaga. Both present very similar layerings and materials and a wide variety of patterns. The second group comprises the altarpiece of La Piedad, Oñate and the altarpiece of San Juan Bautista, Oñate. Each of these altarpieces show just one type of filling mass and not many variations in the technique, materials and location of the patterns. Both altarpieces not only belong to the same town but to the same church (the Church of San Miguel).

CONCLUSION

Three interesting conclusions arise from the previous observations.

First, they support the hypothesis of the older the execution date the more variety and complexity of techniques, materials, patterns and locations of the applied brocade. Hence, in the altarpieces of Gipuzkoa, juxtaposed and isolated applied brocades developed from being used on vestments and backgrounds to leaving the flat areas located in the backgrounds to the juxtaposed and the most irregular areas located in the vestments to the isolated. This indicates that at the final stage of the practice of the technique (mid-16th century) the applied brocade was employed in a less complex way, probably because new less complex decorative painting techniques were starting to be used. Based on this the applied brocades and so the six studied altarpieces can be classified in three groups:

1. The triptychs of Rentería and Zumaya dating from 1505 to 1515.
2. The altarpieces of La Santísima Trinidad, Oñate and the altarpiece of Alzaga dating from 1531 to 1550. Probably dating closer to the beginning and mid-1530s.
3. The two altarpieces in the Church of San Miguel, Oñate dating from 1535 to 1566. Probably dating closer to the late-1530s beginning-1540s.

The second conclusion is the possibility of giving a more approximated execution date to the inexact-dated altarpieces (the altarpiece of San Juan Bautista and the altarpiece located in Alzaga) based on the study of the applied brocades.

Finally, the third and last conclusion refers to the altarpiece of San Juan Bautista. At the beginning of this study the presence of applied brocade in this altarpiece was not sure due to the good deal of retouching and the poor conservation state of the original paint that was still conserved beneath the restoration. By means of the created protocol of study and the analytical resources it was possible to confirm the use of juxtaposed applied brocades in the backgrounds of the relieves of the altarpiece.

The forthcoming stage in the investigation will focus on a closer examination of the analytical results and the documentary sources. This will result in a complete research of the applied brocade in Gipuzkoa with original and bibliographical information.

Although more conclusions are to come of the not very known technique of the applied brocade it is important and interesting to anticipate the analytical findings obtained so far.

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