



Versión en INGLÉS



# Klucel® G reagents: adaptation and application as facing in the lightweight sculpture Santiago Apóstol from Izúcar de Matamoros, Puebla

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## Abstract

After the September 19, 2017 earthquake, the dome of the church de Santiago in Izúcar de Matamoros, Puebla, collapsed on its patron saint Santiago Apóstol, a 16th century monumental sculptural group made with corn stalk paste, resulting in complex effects of deterioration and fragmentation of the piece. The conservation team of the Instituto Nacional de Antropología e Historia (INAH)'s Taller de Escultura Policromada of the Coordinación Nacional de Conservación del Patrimonio Cultural (CNCPC) encountered important challenges during the mechanical stabilization processes, among them, finding a suitable facing system compatible with the physicochemical characteristics of the polychrome sculpture. During the options research, Tania Estrada Valadez of the Taller de Documentos Gráficos (TDG) of the CNCPC was consulted, and then, the proposal of using remoistable Japanese tissue with Klucel® G—a common method for document conservation processes—was evaluated to be applied as facing system in the Santiago case. The collaborative work between conservation specialties resulted in the discovery that a method intended for documents can be successfully adapted as facing to protect delicate and highly water-soluble polychrome during the conservation processes.

## Keywords

Polychromed lightweight sculpture; gold leaf; reagents; facing; Klucel® G; Santiago Apóstol.

## Conservation challenges

In the September 19, 2017 earthquake, the dome of the church of Santiago in Izúcar de Matamoros, Puebla collapsed on its patron saint Santiago Apóstol, a 16th century monumental sculptural set that resulted severely damaged. After the natural disaster, the community went to the Instituto Nacional de Antropología e Historia<sup>1</sup> (INAH)'s Coordinación Nacional de Conservación del Patrimonio Cultural<sup>2</sup> (CNCPC) to request the rescue and conservation of the work.

<sup>1</sup> National Institute of Anthropology and History (note from the translator).

<sup>2</sup> National Agency for Cultural Heritage Conservation (note from the translator).



The lightweight sculpture attracted the attention of the conservation team of the Polychrome Sculpture Conservation Laboratory due to its exceptional technological characteristics. Such as its large dimension, its manufacturing technique (amate paper support covered with corn stalk and corn stalk paste), and its polychromy that imitates a golden armor covering the entire body of the saint. The armor is decorated with sgraffito and fine brushstroke decoration. Due to its advanced degree of deterioration and manufacturing technique, the case immediately raised interesting theoretical and technical challenges for its treatment.



Figure 1. Santiago Apóstol sculptural set before the earthquake (left) and horseman after the earthquake inside the facilities of the Taller de Escultura Policromada (right).  
 Images: Izúcar de Matamoros Community, n.d. and Julio Martínez Bronniman, ©CNCPC-INAH, 2018.

Given the main purpose of recovering the shape and structure of the horseman, one of the challenges to overcome was to find a method or material to temporarily protect the polychrome layer during the mechanical stabilization and volume recovery processes, which involved high humidity and constant handling. Sgraffito made with metal foil is extremely sensitive to the presence of humidity, and the ground layers to be protected showed fragility, disintegration, and cracking. The combination of these characteristics was decisive to choose a material to carry out safely and effectively the conservation processes.

The facing had to meet the following characteristics:

1. The use of a water-insoluble adhesive or one that requires a minimum amount of water to avoid solubilize of the metal foil and water-soluble decorative motifs (such as those in blue).
2. Be adhesive enough to adhere properly to the surface and not leaving remains when it has to be removed.
3. Its substrate had to be inert, sufficiently resistant and flexible to adapt to the shape of the surface and withstand mechanical movements, and transparent enough to allow observation of any reaction in the protected area.

Considering that the characteristics of some of the materials used in facing systems of a polychrome sculpture did not work in this case, the team began to look for options to substitute them and decided to consult Tania Estrada Valadez of the Taller de Documentos Gráficos (TDG), also CNCPC's. After considering the characteristics, she proposed to evaluate the performance of the remoistable Japanese tissue with Klucel® G<sup>3</sup> to protect the required areas. This method<sup>4</sup> has been successfully used in the treatment of paper, but up to now, there are no known references of its use as a facing or in any other type of cultural asset.

### Experimentation and results

The remoistenable tissue subjected to the experiment were prepared using Klucel® G at 3 % in water (weight/volume percentage) by Estrada, since in her experience, it is the most suitable percentage for different documents treatments.

For the tests, different ultra-thin Japanese paper were chosen to serve as a stabilizing membrane between substrates. Aspects as thickness, transparency, strength, fiber direction, flexibility, and weight of the paper also was subject of evaluation. Additionally, as a basis for determining the solvent to be used in the tests, the results of the solubility tests carried out on the polychromy were considered. The acetone proved to be the optimum solvent as it did not change the physical or chromatic characteristics of the surface.

A small facing test of approximately 5 X 2 cm was performed on a highly fragmented section of the left arm of the horseman. The adhesive was remoistened with a 1:9, water:acetone solution, applied with a swab over the surface. During the application, the adhesive remained within the limits of the paper dimensions, with no wrings, shrinkage, changes in the saturation of the polychromy, or any other effect that could indicate incompatibility of the materials with the substrate. The remoistenable Japanese tissue with Klucel® G dried in five minutes and allowed to observe the surface beneath. To define the resistance of the facing, the left arm with the fragmented zone was subtly shaken. The polychrome remained in place. Then the dry facing was removed from the surface and it was cleaned with a swab with the same solution used before to remove any remain of adhesive. The facing system didn't leave remains on the sculpture, neither chromatic alterations.

Of all the tested papers, the thinner one had the best results due to their resistance during the manipulation of zones that required the mechanical stabilization of the support. Due to its translucency, the facing allowed to observe the behavior of the underlying layers during these processes. Furthermore, it was determined that the remoistenable Japanese tissue with Klucel® G can be used only in small areas, for emergent actions and within very short periods (no more than a couple of hours). Also that their immediate removal, once the process is finished, reduces the risk of damaging the sgraffito or decorative motifs when the facing is removed.

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<sup>3</sup> "Klucel G is a hydroxypropyl cellulose-based adhesive used in paper restoration because of its compatibility with paper and its long-term stability and reversibility" (Odor, 2014: 95). Original citation: "El Klucel G es un adhesivo a base de hidroxipropil celulosa, utilizado en la restauración de papel por su compatibilidad con el mismo, y por su estabilidad y reversibilidad a largo plazo" (Odor, 2014: 95).

<sup>4</sup> The remoistable Japanese tissue with Klucel® G must be previously prepared on acrylic acetates, applying several layers of the fresh adhesive overlapped with a layer of the previously analyzed and selected Japanese paper. After letting it dry completely, it can be used by cutting the material to the required dimensions with a scalpel and applied to the desired surface. The term "remoistable" describes a way it should be adhered to the surface, using a solution of nine parts of a solvent, that least affects the paint layer, to one part of water on a swab. The solution has the effect of restoring the "adhesive" property of Klucel® G placing it in its specific position. This method has been colloquially compared to a sticker.



## Applications in intervention

### *Windows for hollow stabilization*

One of the most affected parts was the left arm, among the multiple damages, there was a hollow<sup>5</sup> in the elbow affecting the stability of all the layers. Due to this, it was proposed to treat that section by creating a "window" to stabilize the area from the inside, restoring volume, shape, and strength to the arm. Before doing so, the area was protected with a facing using the remoistable Japanese tissue with Klucel<sup>®</sup> G of approximately 15 X 20 cm. It was adhered to the surface with the previously used solution.



Figure 2. The entire left arm before the intervention (left). Detail of the elbow (right).  
Images: Julio Martinez Bronniman, ©CNCPC-INAH, 2018.

After the facing, a window was cut up following the cracks and tears already present in the area. It was achieved without losing polychrome fragments, which proved the proper functioning of the facing. Once the conservation process was completed in the underlying layer, the facing was removed to avoid damaging the gold leaf. After its successful removal, the stabilization processes of the entire internal area and surrounding superficial polychrome layers were carried out.

In this case, the facing allowed the layers to remain in place during the treatment for the needed time to carry out these actions adequately. Moreover, it was found that the adhesive had no adverse reactions that endangered the stability of the polychromy, being easily removed without leaving remains on the surface.

### *Protection of polychrome when drilling dowels holes*

During the intervention of the Apóstol Santiago, it was necessary to drill several holes to place dowels for joining the extremities to the torso. For example, three rectangular-shaped facings were applied with the same method described above where three holes were to be drilled. The purpose of the facings was avoiding further losses of the original polychromy during the use of the tool and the application of adhesive.<sup>6</sup> The facings took approximately one minute to dry and adhere to the surfaces.

<sup>5</sup> In this case, we refer to the loss of the original support material (corn stalk and corn stalk paste) by compression and pulverization, leaving a space between the preparatory and decorative layers and the amate paper support.

<sup>6</sup> The adhesive used to join the dowels was Kremer<sup>®</sup> glue, which due to its water component could damage the golden and polychrome surfaces.

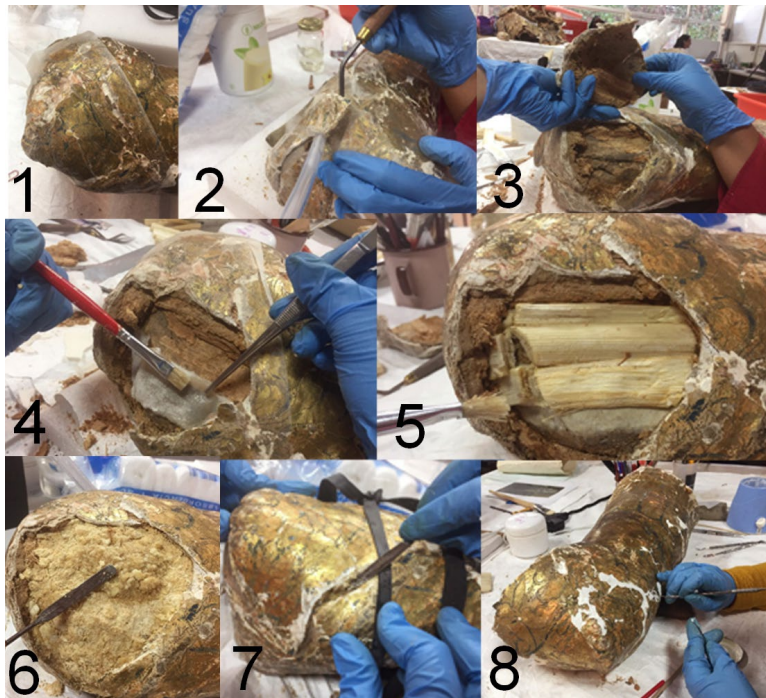


Figure 3. Elbow stabilization treatment. Images: Mariana Alejandra Aguilar Gutiérrez and Zulema Ayerín González Gamboa, ©INAH-CNCPC, 2018.

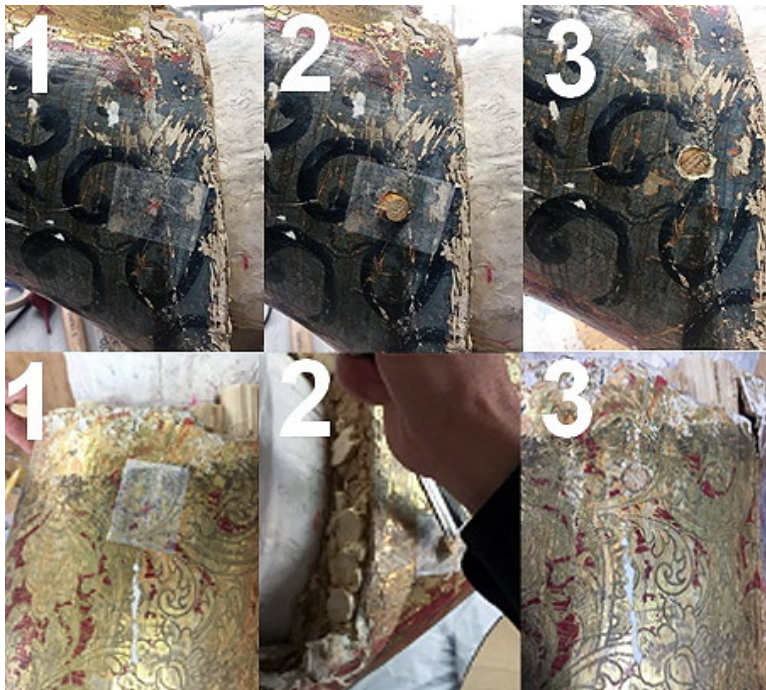


Figure 4. Dowel placement process in two zones of the sculpture. Images: Zulema Ayerín González Gamboa, ©INAH-CNCPC, 2018.



The holes were made using a drill and drill bits for wood. As it can be seen in figure 4, the dowels –longer than the practiced hole– were placed; once dry the excess was eliminated with a gouge. Then, the facings were removed using a scalpel, and then applying the same solution on a swab to eliminate the remains. It was observed that the facings were ideal for keeping the polychromy and stratigraphy in place during the drilling, thus avoiding the loss of the sgraffito. It was also observed that they prevented the dissolution of the blue color and gold leaf of the polychromy when the glue was applied, thus preserving the delicate surface intact.

### Conclusions

Without a doubt, the conservation of Santiago Apóstol sculpture has been a challenge in technical and theoretical terms for those responsible for its treatment. One of the main challenges was finding a suitable material for the temporary protection of the different substrates during the handling. Needed practice to recover the shape and structural stability.

Within the experimentation designed to solve this problem, it was found that facing with remoistable Japanese tissue with Klucel<sup>®</sup> G applied on the surface, solved the specific needs of this case and provided an innovative and viable procedure for future study cases where its use and results can be evaluated.

This conservation achievement would not have been possible without the collaboration between specialists from different areas within the CNCPC. The constant communication and discussion on the methods and materials that can be used opened diverse possibilities for the adaptation and experimentation according with the conservation needs of cultural property.

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### References

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