Figure 1: Paraloid B-72 gesso infills on a painted and gilded Philadelphia Neo-classical armchair.

Further uses for Paraloid B-72: Infilling systems for gilded, painted and lacquered wood

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Introduction

PARALOID B-72, A COPOLYMER OF ETHYL methacrylate and methyl acrylate, is a chemically stable, non-reactive polymer, widely used in conservation treatments as a consolidant, a varnish, and an inpainting medium. This paper discusses its additional use, and its versatility, as a binding medium for infilling systems in the restoration of complex surface coatings on wooden decorative arts.

When infilling losses to objects with complex surface coatings on wood, Paraloid B-72 can be useful as a binder due to its solubility in a wide range of organic solvents. Specifically, conservators frequently encounter objects with historic coatings that are sensitive to both water and other polar solvents such as alcohols or ketones. Infilling systems that utilize Paraloid B-72 in aromatic hydrocarbons allow for additional treatment options for objects such as gilded decorative arts with varnish-coated water gilding; New Mexican *Santos* with varnished water-sensitive paints; and lacquer objects with solvent-sensitive urushi coatings that have been damaged by UV light.

Further, Paraloid B-72 bound infilling materials can be applied quickly, and polished or burnished to match the subtle reflective surfaces found on gilded and lacquered objects. B-72 infills can also be shaped, textured, or cast from moulds to match the surface textures of aged, painted wood.

Gilded Objects

In the last several years, synthetic polymers have been widely used by conservators of gilded objects to replace animal glue in water gilding systems for the loss compensation of gilded wood. Such materials include the use of polyvinyl alcohol gesso and bole; proprietary waterborne gessoes and boles such as the Kohlner Water Gilding System, and Aquazol-based gesso and bole (containing {poly(2-ethyl-2-oxazoline}). The research and proposed usage of these polymers was prompted by a need for materials that are more easily reversible than rabbit skin glue-based water gilding, and are potentially safer in their application to historic water gilded surfaces.

However, these non-traditional ingilding systems share in common the use of water or other polar solvents for application, leveling or smoothing and removal. Since historic water gilded surfaces are often sensitive to water, and since they may contain varnish coatings that are sensitive to other polar solvents, B-72 infilling systems based on aromatic hydrocarbons would be safer for infilling losses.

In a recent treatment of a rare Philadelphia Neo-Classical painted and gilded armchair, owned by the Yale University Art Gallery and conducted at the SPNEA Conservation Center in Waltham, Massachusetts, solvent testing revealed that the historic water gilded surface was sensitive not only to water, but also to ethanol and acetone. Therefore, a loss compensation system based upon aromatic hydrocarbons such as toluene or xylene was preferable for safe application.

Another advantage to the use of a B-72 infilling medium for this treatment was that the burnished water gilding was frequently surrounded by matte water gilding. Matte water gilding is not only more sensitive to water, but could likely be stained by proposed isolation barrier coats applied temporarily to protect these areas during infilling. Non-aqueous barrier resins, such as Paraloid B-67, Soluvar, and Arkon P-90, have been used by conservators to protect water-sensitive historic surfaces surrounding losses, thus enabling safer application of aqueous infilling materials. In this practice, the resin is then removed after the ingilding is completed. However, the application of water-based infills used with isolation barrier resins still does not solve the problem of safe reversibility of the infills on water-sensitive objects.

Additionally, the curators from Yale had requested that no varnish overcoatings be used on any of the original surfaces of the armchair in order to allow the subtle luster and burnish of the surviving historic gilding to be retained as found after cleaning, and as the basis for the final show surface.

Other solutions for infilling systems were ruled out as well, including hard waxes and other non-traditional ingilding materials that did not include the use of gilder's clay. The ability to burnish the infills was a requirement in this treatment to best match the historic burnished gilding. Further, hard waxes would not be useful since many of the losses were along the reeded turned posts where adhesion to the ash substrate could not be assured.

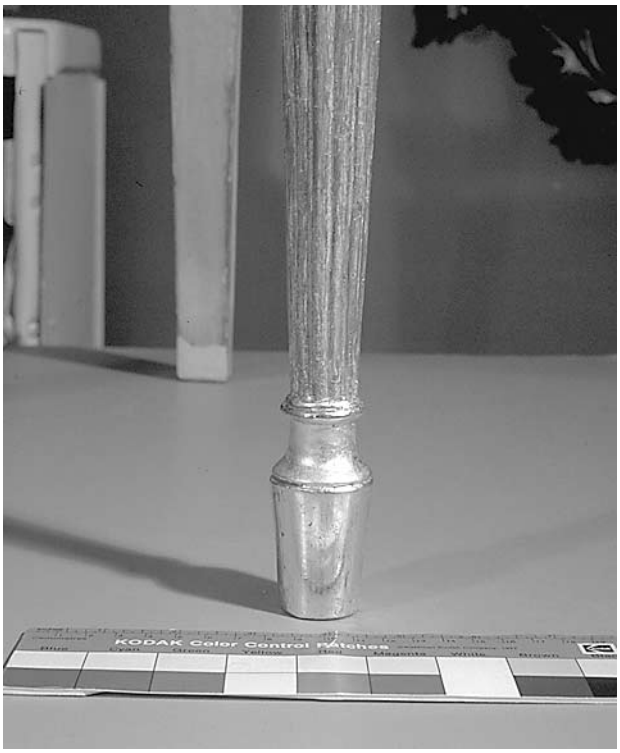
As with the use of polyvinyl alcohol or Aquazol, the B-72 resin was successfully used as a binder for the infills to replicate the traditional water gilded surface for both the matte and the burnished water gilding.

Traditional fillers were used for the gesso formula, which included gilder's whiting and kaolin with the B-72 resin, 20% w/v in toluene.

Recipe for Paraloid B-72 Gesso
• 90 ml Paraloid B-72 20% w/v in toluene or appropriate solvent
• 96 grams calcium carbonate/kaolin mixture, 2:1 by weight

Slowly sift whiting mixture into B-72 solution without stirring until no additional whiting can be absorbed. Gently stir until whiting is evenly incorporated into the B-72 solution. Strain through a fine cloth or screen before use.

The gesso was prepared and applied much in the manner of traditional gesso, but without the need for heating, which can cause air bubbles, resulting in unwanted pinholes in the infills. The gesso was applied by brush to the sites of loss that had first been sealed with clear B-72, 20% w/v in toluene. To level the infills, cloth-covered leveling tools made from wood were used with toluene to avoid the need for abrasive materials or sandpaper. The resulting B-72 gesso approximates well the surface characteristics of rabbit skin glue gesso. *(fig. 1)*



Yale University Art Gallery, New Haven CT

Figure 2: Burnished and unburnished Paraloid B-72 ingilding on Philadephia Neo-classical armchair.

Once the gesso infills were completed on the Neo-Classical armchair, a B-72-based bole was prepared and applied in preparation for the replication water gilding.

Recipe for Paraloid B-72 Gilder's Bole
• 16 grams finely ground gilder's clay
• 54 ml Paraloid B-72 15% w/v in toluene or appropriate solvent
• additional solvent to pre-wet the ground clay

Grind the dry clay with a glass muller on a thick glass panel, incorporating enough solvent to form a soft paste. Slowly incorporate the B-72 mixture until the proper viscosity is achieved. Strain through a very fine cloth such as PECAP (a finely woven monofilament polyester cloth) before use.

Like the gesso, the bole was prepared in the same manner as traditional bole. A dry gilder's clay was finely ground, wetted with toluene, and then incorporated into a 15% solution of B-72 in toluene to the proper viscosity. The bole was applied to the infill sites using a soft brush. Once dry, the bole was lightly polished with Micromesh abrasive polishing cloth and horsehair cloth.

Twenty-three karat gold leaf was applied to the infills using a toluene/naphtha mixture for the gilding liquor, prepared with a few drops of the 15% B-72 stock solution. The infills were wetted as with traditional water gilding, and the leaf applied with a gilder's tip. Hours later, the gilding was burnished with an agate, in the same manner as traditional water gilding. *(fig. 2)* Finally, the newly burnished B-72 ingilding was distressed to match the wear and age characteristics of the adjacent historic gilding. *(fig. 3)*

The use of B-72 in the treatment of polar solvent-sensitive water gilt surfaces has many advantages. It can be used as a binder with the traditional fillers used in water gilding, thus achieving an exact replication of a traditional water gilt surface. Due to the fast evaporation of the solvents used to dissolve the B-72, it can be applied easily and rapidly. Its ability to dissolve in aromatic hydrocarbons enables it to be safely applied and later removed from sensitive or natural resin coated water gilding.

Further, B-72 infills can be easily distinguished from historic materials under UV light and with other methods of examination. B-72 resin has been successfully used in the treatment of coated wood, including its use as a binder for infills that contain glass microspheres. It is compatible with organic coatings on wood, and is hard enough to withstand burnishing.

Urushi Lacquer Objects

Based upon the author's experience with the use of B-72 infilling systems for gilded objects, it followed that a similar approach could be taken for the restoration of urushi lacquer coated wood.

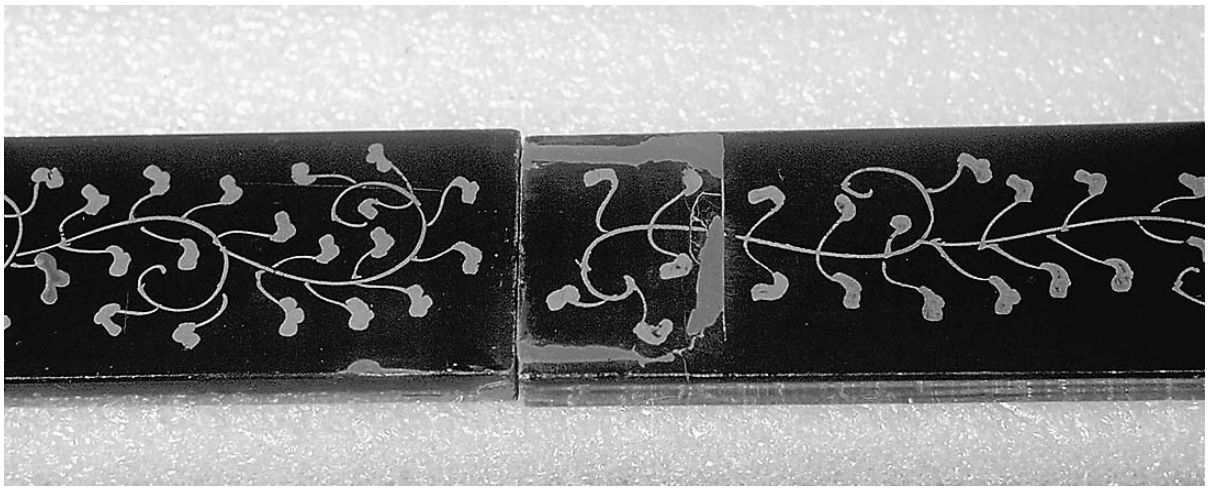
Western conservators who treat urushi lacquer are familiar with the use of B-72 resin as a varnish that can be used to color and coat infills to achieve a good match for the tone and sheen of urushi. In using non-traditional materials for loss compensation, B-72 can be a good choice since many urushi-coated objects may be sensitive to both polar solvents and water, possibly due to degradation of the urushi coating when exposed to UV light over time.

Yale University Art Gallery, New Haven CT

Figure 3: After treatment, Philadephia Neo-classical armchair.

Various infilling materials have been used by Western conservators for deep losses to urushi, including wax mixtures often containing carnauba wax; kaolin or calcium carbonate-based putties with binders such as polyvinyl acetate, polyvinyl alcohol, acrylic resin emulsions and polyvinyl acetyl; and polyester resin systems. B-72 resin has been utilized for infills with glass microspheres, particularly as underfills for lacquer that is tented and no longer in full contact with its shrunken wooden substrate.

Most of the above listed materials have advantages for use in the loss compensation of urushi coatings. However, some may present problems with regard to safe application or reversibility for more solvent-sensitive objects. The use of B-72 as a binder with colored clay fillers offers advantages for the loss compensation of complex, sensitive coatings on urushi lacquer.



Peabody-Essex Museum, Salem, Massachusetts

Figure 5: Paraloid B-72/ clay infills on the shaft of a 19th century Japanese model palanquin.

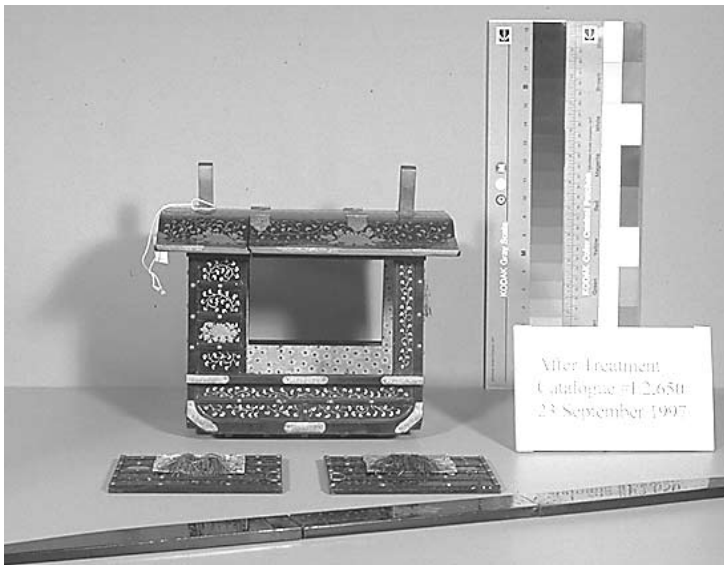
As with the treatment of the gilded chair, B-72 was successfully mixed with clays, solvent-leveled, and polished to match exactly the character of traditional urushi for the loss compensation of a 19th century Japanese model palanquin in the collection of the Peabody-Essex Museum in Salem, Massachusetts. *(fig. 4)* As with other historic objects containing urushi lacquer, the coatings on the model palanquin were found to be highly sensitive to water and to polar solvents. There was obvious evidence of UV light damage to the lacquer and to the textile portions of the model.

For infilling losses to urushi lacquer, the advantage to using a clay filler with the B-72 resin is that the infills can be built up more quickly than with colored resin alone, and they can be polished to any degree of surface reflection required. Experience has shown that the proportion of B-72 to clay can be higher than the above mentioned recipe for B-72 bole, and may vary from one treatment to another.

It is important that the base infill color match the undercolor of the urushi coating on a particular object. For example, black-lacquered objects often contain underlying cinnabar red-colored lacquer. This is necessary to consider and replicate when trying to match exactly the tonality of an urushi object.

The infills can be applied by brush, or with a fine airbrush, which is a precise and often quicker method for achieving a smooth infill. As necessary, the infills can then be safely solvent-leveled with an aromatic hydrocarbon, and when dry, can be polished with Micromesh abrasive cloth, horsehair cloth, or traditional polishing powders. *(fig. 5)*

Having completed the B-72 resin/clay infills, a synthetic polymer such as Paraloid B-67 in naphtha, colored to match the adjacent urushi lacquer, can be sprayed with an airbrush to achieve a match to the top coatings of urushi. Experience has shown that B-72 resin (sprayed) can also be used as a colored or clear varnish over B-72 infills. However, Paraloid B-67 resin polishes nicely to a wide range of surface sheens, including the high gloss



Peabody-Essex Museum, Salem, Massachusetts

Figure 4: After treatment, Japanese model palanquin.

El Rancho de Las Golondrinas Museum, Santa Fe, NM

Figure 6: Paraloid B-72 gesso infills on a New Mexican* retablo *of San Antonio of Padua.

sometimes necessary for matching urushi lacquer. Further, since B-67 is dissolved in petroleum-based solvents that do not disturb the B-72 resin, the colored B-67 coatings will not blur into the underlying colored infills.

An additional advantage to the use of B-72 as a binder for infilling lacquer is that it can be used in problematic areas where lacquer has been lost over structural joints that have moved due to shrinkage or fluctuations in relative humidity. The B-72 resin does not restrict movement of the original materials, but is more flexible than the original urushi coatings.

Finally, B-72 infilling materials can be cast from moulds to match craquelure and other surface textures that some urushi objects may contain. In the last portion of this paper, B-72 cast infills will be described.

Painted Wooden Objects

Paraloid B-72 resin can also be used as a binder for infills in the treatment of varnished water-sensitive painted wooden objects, such as New Mexican *santos*.

Although New Mexican *retablos* do not have the smooth sheen of gilding or lacquer, they share the characteristic of being sensitive to water, since the original paints are water-based. They also usually contain varnishes or coatings that are sensitive to polar solvents such as ethanol and acetone.

B-72 gesso based on aromatic hydrocarbons can be prepared for the infills for painted wood in much the same manner as the gesso for the gilded armchair described above. However, formulations may vary in order to best match the character of the original calcium sulfate gesso used in New Mexican *retablos*.

In an early 19th century New Mexican *retablo* of San Antonio of Padua, from the collection of El Rancho de Las Golondrinas Museum in Santa Fe, New Mexico, the infills were brushed on, solvent leveled, and then textured to match the original paint. (*fig.* 6) The texture was achieved by dabbing dots of B-72 gesso with a fine brush. The quick drying rate of the B-72 gesso allows for precise dots and daubs.

El Rancho de Las Golondrinas Museum, Santa Fe, NM

Figure 7: After treatment*, retablo *of San Antonio of Padua.

Once completed, the infills were inpainted using Paraloid B-67 in mineral spirits, mixed with dry pigments to achieve a slightly matte surface sheen, matching the present condition of the original varnished paint. *(fig. 7)*

The early 19th century New Mexican *retablo* of Santa Rita of Cascia, also from El Rancho de Las Golondrinas Museum, required a different approach to match the uneven and severely cracked historic paint. In addition to the textural inconsistencies, the evidence for the slightly confusing imagery around the head of Santa Rita indicates that this is essentially two historic *retablos*, one painted over the other. The tradition of overpainting or re-painting religious images is quite common and is often valued and retained as part of the object's history of use. Therefore, the curator for this project requested that minimal loss compensation be conducted to better unify the upper image layer, without obscuring the painted image, that could be seen beneath.

For the sites chosen for infills, B-72 bulked with calcium carbonate was cast from silicone rubber moulds that were made from an area adjacent to the large loss below the head. Once dry enough to handle, the thick cast film was cut to fit the loss and glued into place with the B-72 resin, 20% w/v in toluene. Additional B-72 gesso was brushed along the edges of the cast infill to blend it into the edge of the loss. *(fig. 8)*

The infills were then inpainted to match the color and sheen of the historic paint using B-67 in mineral spirits with dry pigments.

El Rancho de Las Golondrinas Museum, Santa Fe, NM

Figure 8: Paraloid B-72 cast gesso infill on a New Mexican* retablo *of Santa Rita of Cascia.

Conclusion

Due to the success of recent treatments using Paraloid B-72 resin as a binder for infilling systems, the author recommends that it be added to the list of stable, safe, reversible, and easily workable materials used by conservators for the loss compensation and restoration of complex surface coatings on wooden objects.

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Materials and Products

Paraloid® B-72
(copolymer of ethyl methacrylate and methyl acrylate)
Rohm and Haas Company
Philadelphia, Pennsylvania

Paraloid® B-67
(poly-isobutyl methacrylate)
Rohm and Haas Company
Philadelphia, Pennsylvania

Aquazol
{poly(2-ethyl-2-oxazoline)}
Polymer Chemistry Innovations, Inc.
Tucson, Arizona

Vinol™
(polyvinyl alcohol)
Air Products and Chemicals, Inc.
Allentown, Pennsylvania

Kohlner Burnishing Clay and Water Gilding System
Kolner-LandzGold-Grund
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Arkon P-90
(a fully saturated alicyclic hydrocarbon)
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