7TH INTERNATIONAL MEETING
ON RETOUCHING OF CULTURAL HERITAGE,
RECH7

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FOREWORD

Ana Bailão, RECH Group Chair

Between 12th and 14th October 2023, the RECH Group organised the seventh international conference in Lisbon, in collaboration with the Faculty of Fine Arts of the University of Lisbon. Specialists from various fields of conservation gathered to discuss issues surrounding chromatic reintegration.

The event took place over three days, featuring thirty-one presentations, demonstrations and two workshops. Experts from Croatia, Spain, Portugal, Turkey, Austria, Poland, Israel, Canada, Monaco, Belgium, Italy, Taiwan and Brazil participated.

Interests and concerns regarding chromatic reintegration practices were shared, both from the perspective of decision-making and materials and execution techniques. A trend towards seeking more sustainable and less toxic approaches was observed throughout the event.

We express our gratitude to all speakers and participants of the conference, to the sponsors and to the entire team at the Faculty of Fine Arts who hosted us.

Special thanks to the Committee members for their support and contributions during the conference and to this publication.

This publication represents a truly collaborative effort that we hope will assist the conservation and restoration community in developing their chromatic reintegration work.

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THE USE OF TYLOSE® MH 300 IN THE CHROMATIC REINTEGRATION OF MATTE CONTEMPORARY PICTORIAL SURFACES

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Abstract

The chromatic reintegration of matte contemporary artworks poses countless challenges due to the artist's usage of new techniques and materials which result in surfaces that are extremely susceptible to physical and chemical damage and that tend to present alterations and losses that interfere with the comprehension of the artworks. To find compatible inpainting materials, several binders were prepared into samples, put through natural and accelerated aging tests, and evaluated for physical stability, chromatic and gloss variations, solubility, and removability. One presented an outstanding result: Tylose® MH 300 P2, a water-soluble non-ionic cellulose ether, highly matte and stable, with positive results on chromatic stability. To validate the tests' results in a practical context, Tylose® was used as a retouching binder for two artworks presenting characteristic problems of matte-surfaced artworks. It proved to be versatile, and easy to handle. This research aims that Tylose® becomes a viable alternative binder for retouching matte-surfaced artworks.

Keywords:

contemporary artworks,

matte surfaces,

chromatic reintegration,

binder, Tylose® MH 300 P2,

reversibility.

Introduction

The chromatic reintegration of contemporary artworks poses countless challenges due to the artists' usage of new techniques and materials, many of which were not developed for artistic use. Among the main issues found at the chromatic reintegration phase are the use of incompatible materials, the use of modern paints – such as acrylics, vinyl, nitrocellulose, alkyd paints, dyes, etc., all of them having intense saturation and finely ground pigments –, the use of specific textures and voluminous impastos, the presence of color fields and flat uniform surfaces, the absence or excess of gloss in the paints, and the choice of leaving the painting unvarnished. All these factors result in surfaces that are extremely susceptible to physical and chemical damage and that tend to present alterations and losses that interfere with the comprehension of the artworks (Scicolone, 2002).

It should be highlighted that artworks with smooth and delicate surface finishes tend to pose the biggest problems for inpainting: the interruption of the homogenous pictorial surface can cause an irreparable loss in the artist's message, and a perfect *mimetic* retouching may be impossible to achieve (Santabárbara Morera, 2016; Schinzel, 2003; Scicolone, 2002). This is especially true in monochromatic artworks, in which space is created through gradual changes in color and/or gloss. Consequently, any alterations on the surface gloss can cause great disturbances on the work's spatiality, and the simpler the composition and the fewer the colors that are used, the more disturbing the alterations seem (Llamas Pacheco, 2009; Mezzadri and Sidoti, 2020; Santabárbara Morera, 2016; Schinzel, 2003).

A matte surface is characterized by diffuse superficial reflection, which means the incident light is dispersed in all directions (Johnston-Feller, 2001). Although a matte surface is not always an intentional choice by the artist, being only a consequence of the chosen material or its aging, it becomes an essential characteristic of the artwork's appearance. Added to that, generally, is the absence of a varnish layer, an intentional choice by the artist (Llamas Pacheco, 2011). Unvarnished matte surfaces are very susceptible to abrasions, grease deposits, stains, and yellowing, especially around the borders of the artwork due to bad handling and the usual absence of frames by choice of the artists (Llamas Pacheco, 2009). The conservation intervention itself can cause damage to such sensitive paint layers, such as abrasions, friction, and polishing of areas during the cleaning process, or tide marks after aqueous cleaning treatments or chromatic reintegration, drawing more attention to the damaged area (Mack, Sturman and Escarsega, 2007).

Regarding contemporary artworks with matte surface finishes, traditional reintegration materials don't always provide satisfactory results: since they cannot mimic properly characteristics such as the saturation and the luminosity of the colors, the finely ground pigments, or the surface gloss, they tend to create a visual disturbance (Llamas Pacheco, 2009; Mezzadri and Sidoti, 2020; Sims, Cross and Smithen, 2010).

Even though there isn't one ideal or perfect material for use on every occasion – each presents advantages and disadvantages –, having a broad range of versatile possibilities will facilitate the selection-making process, based on the different characteristics of the artwork's surfaces (Jacqmin and Soldano, 2020).

Experimental

After bibliographical research and aiming to find alternative binders for the chromatic reintegration of matte contemporary artworks, a technical study was made using six different binders. They should fit the fundamental criteria of reversibility and stability, and also present a desired versatility, especially regarding gloss levels. Other desired characteristics were the ease of handling and preparation, durability, and their applicability regarding different artists' techniques and practices.

Considering the general sensitivity of the most usual paints used in contemporary art (acrylics, vinyl, oils) to most solvents – even hydrocarbons with low aromatic content –, it was defined that the binders should be soluble and reversible in adjusted water, which is deionized water with its pH and conductivity altered by volatile alkalis and acids until the desired/appropriated value is obtained for different uses. For acrylic paint layers, the recommended pH is 6, and the conductivity is 6mS/cm. That should cause minimal swelling of the acrylic paint layers (Ormsby et al., 2015).

Materials

The six selected binders were gum arabic (a natural polymer), carboxymethylcellulose (CMC), Klucel® G, Tylose® MH 300 P2 (three cellulose ethers, semi-synthetic polymers), Aquazol® 500 (a synthetic polymer), and Lascaux Water Resoluble Medium (an acrylic based industrialized medium). After the whole set of tests, being them natural and accelerated aging tests, digital microscopy, spectrophotometric readings, and solubility and removability tests, followed by application in actual artworks in different media, the material that achieved outstanding results was Tylose® MH300 P2, the one to be discussed from this point onwards.

Tylose® MH 300 P2 (methyl-2-hydroxyethyl cellulose) is a non-ionic, cold-water soluble, medium viscosity (300 mPa·s) cellulose ether. It's used as an adhesive and consolidant for paper works (Bartolone et al., 2015; Carnazza et al., 2020; Kremer, n.d.a). It is considered an adhesive with good elasticity and malleability, easy to prepare, resistant, and fast drying, besides being atoxic, reversible, and biodegradable. Also, it has low adhesive power, which makes it more easily reversible (Bartolone et al., 2015). It must be noted that, due to the high-water content necessary in the formulations and the binder's high hygroscopicity, Tylose® shouldn't be used in water-sensitive substracts (Carnazza et al., 2020).

In previous studies found in the literature - most of them unrelated to its use as a binder for inpainting -, Tylose® has presented very good results: one of the most matte binders, with reflectance values inferior to 0.01 (Carnazza et al., 2020); very small color alterations in colorimetric evaluations after accelerated aging tests, being considered stable (Abdel-Kareem, 2005; Bartolone et al., 2015); some loss of elasticity after accelerated aging, and resistance to biodegradation (Bartolone et al., 2015); easy reversibility and no decrease in its solubility after accelerated aging (Bartolone et al., 2015; Feller and Wilt, 1990).

Each of the binders was prepared following proportion suggestions found in scientific papers, considering the goal of a matte result. No additives, such as dispersants, conserving agents, etc., were mixed in any of the binder solutions, to guarantee that any alterations found would be a result of the pure binder and its dispersion in water. The Tylose® preparation suggested by Carnazza et al. (2020) was a dilution of 2% in deionized water. The dilution took about 3 hours, resulting in a low-to-medium viscosity and slightly cloudy solution.

Three equal groups of samples were prepared with two different kinds of support, Fabriano® drawing paper, and an industrial acrylic-prepared linen canvas: a control group, a natural aging group, and an accelerated aging group.

The pigments used for the preparation of paints with the binders were Kremer® XSL Titanium White, reference #26000, very lightfast, easy to disperse in water and water-based binders (Kremer, n.d.b), and Kremer® Cadmium Yellow nº 4, light, opaque, and very lightfast (Kremer, n.d.c).

The acrylic paints used were Winson & Newton Galeria Acrylic™ Mixing White (color number 415), Series 1, Permanence AA ("extremely permanent"), Lightfastness I ("excellent"), PW6 pigment, composed of Zinc and Titanium (Winsor & Newton, n.d.a), and Winson & Newton Galeria Acrylic™ Cadmium Yellow Medium Hue (color number 120), Series 1, Permanence A ("permanent"), Lightfastness I ("excellent"), PY73 and PY83 pigments (Winsor & Newton, n.d.a).

The gouache paints used were Winson & Newton Designers Gouache™ Zinc White (color number 748), Series 1, Permanence A ("permanent"), Lightfastness I ("excellent"), PW5 pigment (Winsor & Newton, n.d.b), and Winson & Newton Designers Gouache™ Primary Yellow (color number 527), Series 1, Permanence A ("permanent"), PY74 and PY138 pigment, containing Quinophtalone (Winsor & Newton, n.d.b).

Each binder originated 12 samples, with total dimensions of 7 × 15 cm, in which were tested: white and yellow bound pigments (in a proportion of approximately 1:1 weight/volume), the pure prepared binders over the support, as well as the binders over the acrylic paints and the gouaches, to evaluate the binders' behavior and interaction in different situations.

The application of the paints was done by paintbrush, straight from their packages and without any dilution. After their drying time, the binders were applied, also by brush. Each different binder was identified by numbers.

In the sample preparation stage, it was already possible to perceive some of the binders' characteristics, related to preparation, application, and paint consistency when mixed with the pigments. Tylose® resulted in a slightly viscous, easy-to-apply paint with good pigment dispersion and good covering power. Regarding the pure binder application over the acrylic and gouache paints, Tylose® originated relatively uniform films, although seemingly bulky, perhaps due to its viscosity. After the films dried, Tylose® presented a very discreet gloss over the paint layers but was completely matte when mixed with both pigments. In the paper samples, both the pure binder and the white Tylose® paint had the most matte results, while in the canvas samples, the pure Tylose® had the most matte results along the CMC.

Methods

Natural Aging Test

The samples set for the natural aging test were aged from March 6 to June 27, 2022. They were attached to the inner part of a transparent glass windowpane that was exposed to sunlight (with daily direct sunlight for approximately 5 hours) in the city of Porto, Portugal. The exposure was 115 days.

Accelerated Aging Test

The samples were aged in the Polytechnic Institute of Viseu, in a Q-SUN Xe-3 Xenon Test Chamber (Q-Lab), with xenon arc lamps and Window Glass filters, using the conditions of ISO 4892-2 norm's Cycle 5: dry condition, 50 W/ m^2 irradiation, 300-400 nm, black panel temperature of 65 °C, chamber temperature of 38 °C, and 50% relative humidity. The total exposure time was 258 hours, which equals 55 years in museum conditions (100 lux, 8 hours/ day, 6 days/week).

Besides the samples, another comparative aging parameter was put in the test chamber: a Blue Wool Scale. Before that, a third of the wools were covered, to evaluate the posterior alterations. After 258 hours, 6 of the 8 dyed pieces of wool presented remarkable alterations, with the 7th presenting subtle changes as well. This should correspond to a period of 50 to 100 years of aging (Materials Technology Limited, n.d.), a superior time than the indicated through the time exposure calculation.

Digital Microscopy

A Dino-Lite Edge Digital Microscope with the DinoCapture 2.0 Version 1.5.44B software was used to get macrophotographies from the samples before and after the aging tests.

Colorimetry

The readings in all sets of samples were done with a Konica Minolta CM-700d Spectrophotometer (standard illuminant D65 and standard observer 10º). Since the binder films weren't completely uniform, some readings were unequal. Hence, three readings were done in each division of the sets, and the arithmetic average of those was considered the definitive value (Johnston-Feller, 2001). The measurements are within the CIELAB color space, using the L*, a*, and b* values to calculate the ΔE*, meaning the color difference, through the formula $\Delta E^* = [\Delta L^{*2} + \Delta a^{*2} + \Delta b^*2=^2]½$ (Abdel-Kareem, 2005; Freeman, 2021; Froyen and Postec, 2009; Johnston-Feller, 2001; Konica Minolta, n.d.).

Gloss Evaluation

The gloss changes were measured through the formula presented by Carnazza et al. (2020), ΔSCI-SCE(L*), using the spectrophotometer measurements from the colorimetry evaluation. According to these authors, "Making a comparison between the glossmeter 60° curve and the ΔSCI-SCE curve, it was possible to notice almost the same pattern. This evaluation allowed us to consider the reliability of the values detected with the colorimeter in relation to the reflected component." (p. 387). Hence, the higher the obtained value, the glossier the sample – even if the value isn't in Gloss Units, but in reflectance percentage.

Solubility and Removability Test

The solubility test was run on the three sample sets, in both supports, in the bound yellow pigment areas. Through a gentle mechanic rolling action with swabs dampened in distilled water, two aspects were measured:

the time and the number of rolling movements necessary to solubilize and remove the paint. The removal test would be stopped in case this action started to cause damage to the support. These tests evaluate the solubility of the paint, as well as the ability of the solvent to remove, ideally, the totality of the applied paint. The ease and the controllability of removing the materials were taken into account, observing any damage or changes to the support/ground layer and if the removal was complete (Froyen and Postec, 2009; Sims, Cross and Smithen, 2010).

Practical test on artworks

This section considers the desirable characteristics (gloss, color, solubility) and the adequate behaviors (viscosity, ease of handling, durability, drying time) of a binder when used as retouching media on actual artworks. The intervention was carried out on two different artworks, composed of diverse supports and materials that are representative of matte contemporary artworks.

The first one was an untitled painting by Maria Isabel Fraga Pereira (1948-), measuring 139 x 173 cm and belonging to the Faculdade de Belas Artes of the Universidade do Porto's collection. Its support is fibreboard with a wood structure glued to its back with PVA glue, prepared with a thin white ground layer, painted with plain color acrylics, and with superficial layers painted with an airbrush. It has some of the most characteristic features of contemporary artworks: matte finish, big areas of plain and homogenous colors, and areas with the characteristic airbrush texture. Chromatically, the palette is defined by the major presence of two colors, yellow and grey, with tonal and chromatic variations towards orange, red, and blue. The damages present in the artwork demand diverse approaches for their reintegration: there's abrasion, transfer, and accumulation of residues due to friction and rubbing between surfaces, grease stains, surface polishing by friction, loss of pictorial layer resulting from mechanical impacts (exposing the support and/or the ground layer), and dirt deposits all over the surface. Many of those damages result from the work's exhibition outside controlled environments, allowing direct contact and close circulation of people and objects.

The other artwork is Forma, Descriptio, Graphis, by Francisco Laranjo (1955-2022), painted in 1982, measuring 223.5 x 145 cm, and belonging to a private collection, yet deposited since 1994 in the Fundação de Serralves – Museu de Arte Contemporânea. It's an Indian ink painting on backdrop paper attached to a fiberboard support, probably with PVA glue. There is also a wood structure glued to the auxiliary support with PVA glue as well. It's unknown when the paper was affixed to the fiberboard, or by whom. However, it's noticeable that several tears were glued - with more or less refinement - during this intervention. It's unclear if those damages were the reason for the attachment of the secondary support or if they were caused by this operation, such as a central tear caused by bad manipulation, adhered with a large amount of wrinkles. As a result of the penetration of the PVA glue, the paper acquired a slight satin gloss and some slight tonal variation. The painted areas remained matte, though. The main damages identified were abrasions with partial loss of support (lifted paper fibers and loss of paint layer). All around the artwork, but especially on the edges, there were chromatic alterations caused by friction, like the polishing of the surface. The tears that were adhered inadequately presented lifted fibers and their consolidation was done in unconformity with the original position. The tears in the bottom of the work had been previously reintegrated with inadequate color matching. There were also tide lines in many areas around the edges of the work, being more visible where there was no paint layer.

Results and discussion

Of all of the tested materials, Tylose® MH 300 was the one that most positively distinguished itself, especially presenting the most matt results on the gloss evaluations and great gloss stability even after accelerated aging. In the following sections, the individual results will be discussed.

Digital Microscopy

On the control set, the paints composed of Tylose® MH 300 and pigment have a film with some body, homogeneously filling the spaces between the paper fibers, even if some of the bigger ones are still visible. The pure binder applied over the paper has a similar result, being the most matte of the tested binders. On canvas, the Tylose® paints generated a very homogenous matte film that didn't fill the whole topography of the support/ground layer.

On the natural aging set, there seems to be a slight decrease in the gloss of the pure Tylose®, but no other observable changes.

On the accelerated aging set, no visible changes are observable in comparison to the natural aging.

Colorimetry

According to the information gently provided by Professor PhD Luisa Hora de Carvalho, a standard observer recognizes color difference conforming to the following indicators: $0 < \Delta E < 1$ – no difference; $1 < \Delta E < 2$ – only an experienced observer notices any difference; $2 < \Delta E < 3.5$ – an inexperienced observer notices a difference; $3.5 < \Delta E < 5$ – the ibserver notices a clear difference; $5 < \Delta E$ – the observer perceives two completely different colors. Hence, considering that a ΔE inferior to 1 is the most desirable result, in the calculation between the control and the natural aging sets (Table 1), the best results were obtained by Tylose® and the Lascaux® medium, both with 3 out of 7 samples in this range. On canvas, Tylose® also had 3 out of 7 samples in this range.

In the calculation between the control and the accelerated aging sets (Table 1), the pigments bound with Tylose® presented results between 0.29 (yellow pigment on paper) and 1.19 (yellow pigment on canvas), demonstrating chromatic stability. The pigments mixed with Tylose® were among the best results obtained among all binders.

Gloss Evaluation

It must be considered that gloss changes vary according to diverse factors, such as the pigments present, the substrate, and the paint brands (Ormsby et al., 2007), which means the results obtained here aren't absolute and many variables are present.

In the control set (Table 2), the binder with less gloss on paper support is the Tylose®, with 0.1, while it has 0.13 on canvas. The pigments bound with Tylose® got results between 0.07 (yellow pigment on paper) and 0.13 (white pigment on canvas).

In the natural aging set (Table 2), the binder with less gloss is the Tylose®, with results of 0.16 on paper and 0.19 on canvas. The pigments bound with Tylose® got results between 0.07 (yellow pigment on canvas) and 0.15 (white pigment on canvas).

In the accelerated aging set (Table 2), the binder with less gloss on paper is the Tylose®, with results of 2.17, while it gets 2.11 on canvas. The white pigments bound with Ty-

Table 1. Color difference between the aging sets, in both supports.

	Name	ΔE* Control-Natural Aging	ΔE* Control-Accelerated Aging		Name	ΔE* Control-Natural Aging	ΔE* Control-Accelerated Aging
PAPER	White pigment + Tylose®	0.837019	0.652227	CANVAS	White pigment + Tylose®	0.347131	0.924824
	Yellow pigment + Tylose®	1.085081	0.2995		Yellow pigment + Tylose®	0.671193	1.193189
	Tylose®	1.840598	**10.87929**[1]		Tylose®	1.23503	3.967569

Table 2. Gloss values in each aging set, in both supports.

	Name	ΔSCI-SCE Ctrl.	ΔSCI-SCE Nat. Aging	ΔSCI-SCE Acc. Aging		Name	ΔSCI-SCE Ctrl.	ΔSCI-SCE Nat. Aging	ΔSCI-SCE Acc. Aging
PAPER	White pigment + Tylose®	0.1	0.12	2.07	CANVAS	White pigment + Tylose®	0.13	0.15	2.05
	Yellow pigment + Tylose®	0.07	0.12	-0.04		Yellow pigment + Tylose®	0.09	0.07	1.95
	Tylose®	0.1	0.16	2.17		Tylose®	0.19	0.19	2.11

[1] The paper support *ΔE** was of 9.82, which reflected on all of the pure binders' *ΔE**.

lose® got the lowest gloss results: 2.07 on paper and 2.05 on canvas. The yellow pigment got the lowest result on paper (-0.04), while on canvas, got a result of 1.95. It's noticeable that Tylose® constantly presents the lowest gloss values, especially on paper.

Comparing the numbers between the control and the natural aging sets (Table 3), Tylose® kept stable results on canvas and a slight variation on paper (0.06). The pigments bound with Tylose® got variations between -0.02 (yellow pigment on canvas) and 0.05 (yellow pigment on paper).

Comparing the results of the control and the accelerated aging sets, the variations were much more significant than in the natural aging set. Tylose® presented a variation of 1.92 on canvas and 2.07 on paper. The pigments bound with Tylose® got the smallest variations among all the binders, with values between -0.11 (yellow pigment on paper) and 1.92 (white pigment on canvas).

Solubility and Removability Test

The tests on the control set obtained the best results. It must be taken into account that the paper support presented bigger frailty and reactivity towards the water than the canvas support. On paper, the friction of the swab may easily result in some degree of raised fibers while attempting to remove the paints. In the case of the Tylose® sample, there was no lifting of fibers, but lots of pigment remained on the support, seemingly having penetrated it. On canvas, its removal was easy and well-controlled, not causing damage to the ground layer or leaving residues.

On the natural aging set, there was a bigger difficulty in removing the paints. None of the binders presented excellent behavior on paper: all of them resulted in at least a slight degree of raised fibers and none allowed complete removal of the yellow pigment. However, among all the binders, Tylose® was one of the best results - even if it raised some fibers and left pigment residue behind. On canvas, the results were better, even if some yellow remains were still visible in the topography of the ground layer when analyzed on the digital microscope.

On the accelerated aging set, the removal time is longer, meaning a bigger difficulty, especially on the paper support. According to Horie (2010), low molecular weight polymers are more easily solubilized than high molecular weight ones, as they demand less energy to break the bonds that unite their molecules (Horie, 2010). This could explain the results obtained by the cellulose ethers. Tylose® was relatively easy to remove, even if remains of yellow pigment were still on the fibers (**Fig. 1**). On canvas, the removal was well-controlled but difficult, leaving yellow residue behind.

Fig. 1. Tylose®-bound yellow pigment, accelerated aging set, after removal test (Photo: Joana Diniz).

Practical test on artworks

In the acrylic painting by Maria Isabel Fraga Pereira, the different kinds of damage required different approaches when chromatically reintegrating. However, pointillism was used since it mimicked the airbrush textures and tonal variations present in the paint layers.

In areas with actual losses, an infilling of Modostuc® was applied. The greatest challenge was finding the adequate tonality, as a very matte inpainting was easily achieved.

Some areas of friction damage had an accumulation of external residues, which were removed as well as possible without causing more damage to the paint layer (Figs. 2, 3, 5 and 6). In the areas where the residue was darker than the original paint layer, the treatment was more complex, since the covering power of the inpainting paint wasn't enough to completely hide the residual material. To control the color influence of that material, a layer of titanium white bound in Tylose® was applied since it possesses good covering power. Afterward, it was possible to follow through with the inpainting like in the other areas (Figs. 3 and6).

The most complicated damages to reintegrate were the ones where the friction polished the surface without removing the paint layer (Figs. 4 and 7). That generated extremely disturbing gloss and color alterations which implied a very matte reintegration to suppress the polish-



Figs. 2, 3 and 4. Kinds of damage present in the artwork: friction with accumulation of light residue, friction with accumulation of dark residue, and polishing of the pictorial surface. Photos: Joana Diniz.



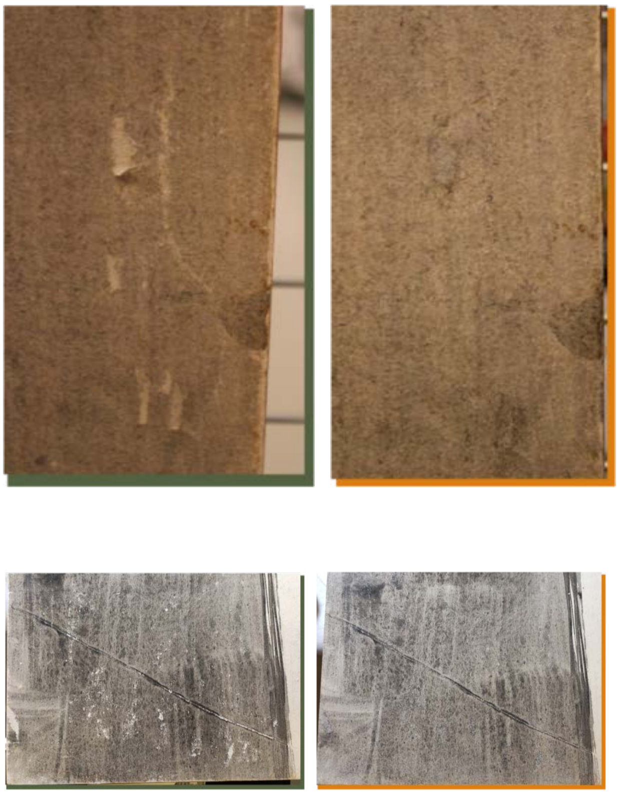
Figs. 5, 6 and 7. The same damages after retouching. Photos: Joana Diniz.

ing. Tests were done with Tylose®-bound pigments and with a layer of pure Tylose®, without obtaining satisfactory results. Then it was resorted to a method described by Bailão & Cardeira (2017) and Sims, Cross & Smithen (2010) for the use of funori, but instead applied to the use of Tylose®: applying the pure binder solution on the area to be inpainted, quickly followed by the application of dry pigments. This required the previous mixing of the pigments in the palette with water until the proper tone was achieved. Once the reintegration had dried, it was softly brushed so that the loose pigments would be removed. The resulting intervention was sufficiently matte, matching the original layer.

On *Forma*, *Descriptio*, *Graphis*, the inpainting treatment also had different specificities for each kind of damage. The first challenge was color matching: even though Indian ink in different dilutions was the only material used, the carbon black pigment available was of a colder tone than the ink. This effect was amplified by the color of the aged paper and of the glue used to adhere the paper to the fiberboard. Hence, ochre, diverse earthen pigments, and titanium white were necessary to reach the precise tone, depending on the damage's location. Once again, pointillism was the technique that was the most useful in mimicking the chromatic stain effects (Figs. 8-11).

The damage that had polished the surface required the same treatment as in the other artwork: the application of a thin layer of Tylose® followed by the dry pigments previously mixed to the adequate color. The results were once again extremely satisfying.

One of the main challenges was the inpainting of the badly consolidated tears and the central tear and its areas of support loss. They required infilling with cellulose pulp, which was much more matte than the surrounding original areas. Tylose® was too matte to achieve a match with the surface's satin gloss: even if, when faced straight, it looked integrated, the moment the observer moved to the side, the reintegration was thoroughly visible. The inpainting was easily removed with distilled water and redone with watercolors (Winsor & Newton®, Professional Water Colour series), to achieve more gloss on the surface. The result looked closer to the original, even though some angles still slightly reveal the outline of the tears.



Figs. 8, 9, 10 and 11.Tears and paint losses before and after inpainting. Photos: Joana Diniz.

After those inpainting experiences, it's possible to conclude that Tylose® has a very satisfactory behavior: a little amount of binder is needed to ensure the formation of a cohesive paint, the paint's appearance is extremely matte, the paint is durable and can be stored, and reutilized since, when resolubilized with water, it has the same properties as when freshly prepared. The only inconvenience noticed is a slight chromatic alteration after drying, desaturating a little when compared to its application, similar to what happens with watercolors and gouache.

Conclusions

As stated, the chromatic reintegration of contemporary artworks presents countless challenges, especially when dealing with matte pictorial layers. Their inherent fragility due to specific textures, plain and uniform colors, and lack of gloss easily expose them to damage that impacts their understanding, concept, and message.

During the testing phase, Tylose® MH 300 P2 was the binding media that outshone the other materials: it had a great absence of gloss and gloss stability and obtained mostly positive results regarding chromatic stability. When testing it in actual artworks, its behavior and results were excellent, being easy to prepare and handle, not requiring a lot of pigmentation, and allowing reutilization of the paint in the palette for long periods. The way it behaved in two different substrates with distinct dynamics (infilling and original paint layer with damages and alterations and paper, paint layer with different degrees of dilution and cellulose pulp) allowed the reintegration in two very different pictorial layers (acrylics and Indian ink), demonstrating great versatility and obtaining great results in color matching and matte finish.

Since Tylose® is a material very little used for chromatic reintegration, this technical study aims to insert it into the series of materials that can be used for this vital intervention stage, making it a viable alternative.

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