Conservation intervention in the plaster panel "Os Pescadores" from the collection of the Faculty of Fine Arts of Oporto University (Portugal)

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Abstract: This article presents the cleaning strategy of the gypsum panel entitled "Os Pescadores", stored for years without a proper conditioning, presenting large amounts of superficial and more adhered dirt. The methodological approach combined the use of wet and dry methods. As a material of great presence in the Portuguese context, it's important to share information on case studies posing specific challenges.

Keywords: Plaster Panel, Faculty of Fine Arts (FBAUP), Dry/wet cleaning, Conservation

Conservación y restauración del panel de yeso "Os Pescadores" de la colección de la Facultad de Bellas Artes de la Universidad de Oporto (Portugal)

Resumen: Este artículo presenta la estrategia de limpieza realizada en el panel de yeso denominado "Os Pescadores", que estuve almacenado tras muchos años sin condiciones adecuadas, presentando una gran cantidad de suciedad superficial aderida. El abordaje metodológico ha combinado el uso de metodos humedos y secos. Teniendo en cuenta la gran presencia de este tipo de material en el contexto português, se revela importante compartir la información sobre casos que presentem desafios específicos.

Palabras clave: Panel de yeso, Facultad de Bellas Artes (FBAUP), Limpieza húmeda/Seca, Conservación

Intervenção de conservação no painel de gesso "Os Pescadores"da coleção da faculdade de Belas-Artes da Universidade do Porto (Portugal

Resumo: Este artigo apresenta a estratégia de limpeza do painel de gesso intitulado "Os Pescadores", armazenado durante anos sem acondicionamento adequado, apresentando grandes quantidades de sujidade superficial muito aderida. As abordagens metodológicas combinaram a utilização de métodos de limpeza húmidos e secos. Sendo um material com grande presença no contexto português, é importante partilhar informação sobre casos de estudo com desafios específicos.

Palavras-chave: Painel em gesso, Faculdade de Belas-Artes (FBAUP), Limpeza húmida/seco, Conservação

Introduction

The Faculty of Fine Arts of the University of Porto includes in its collection a set of sculptures and low reliefs in plaster resulting from the academic activity of its former students, or of pieces acquired for educational purposes.

The panel entitled "Os Pescadores"[1], with 199 cm x 115 cm x 19 cm [Figure 1], by Maria Graciosa Mendes de Carvalho exhibits an iconography with a strong connection with the usual representations of the Portuguese People within the ideology of the Estado Novo regime. The author was born in Avintes(Vila Nova de Gaia) in 1923 and began her studies in the fine Arts faculty in 1939 and concluded the painting Degree in 1949.

The panel shows two male figures, the fishermen, holding in their hands fishing nets, one female figure with a basket, possibly a fish seller and a child holding a fish in one hand and a loaf of bread in the other. As a low relief, the artwork transmits a symbolic force towards contextualizing the spectator within the harshness of the fishing gear, and, at the same time to communicate the values of hard work and labour virtues of the lower classes, very dear to António Ferro, leader of the National Propaganda Secretariat. Although its chronology is still unknown, between 1939 and 1949, the artist was a faculty student, becoming a painter afterward. The formal language and the panel's iconography are suitable for that period.

Figure 1.-"*Os Pescadores*" by Maria Graciosa Mendes de Carvalho. Gypsum panel before intervention (original state). Photograph by Luís Nunes.

"Os Pescadores": Historical, Technical and Material Context

— Brief historical contextualization

The panel "Os Pescadores" comes from the Faculty of Fine Arts of the University of Porto (FBAUP), and its authorship is attributed to Maria Graciosa Mendes de Carvalho, a student of the institution between October 12th, 1939, and August 2nd, 1949 (*Inventário Alumni (1836-1957*), 2021). Since the work was executed in an academic context and is not dated, it is assumed that it was made during that same period (1939-1949).

It is important to note that during this same period, Portugal was under the influence Salazar dictatorship known as *Estado Novo* regime.

The Salazar regime was based on a Christian-democratic ideological matrix, however, from a political point of view, it would prove to be a military dictatorship, privileging the autonomy of two powerful institutions: the Army and the Church (Cruz, 1982). This reality would remain until April 1974, when the Carnation Revolution (or the April 25th Revolution of 1974) put an end to the Estado Novo regime (Lourenço 2018).

On an artistic level, the most used themes focused on historical periods of great importance for Portugal (to praise the country and the current regime), such as representations of leading figures of the Discoveries; Portuguese writers and poets; or even religious figures or landmarks; among other figures with a nationalist impact. During the Salazar regime, Portuguese sculpture of that time is characterized by a certain abstract character, although constructive practices and traditional techniques were still applied (Teixeira 2008).

Since the work under study comes from an academic context, it is essential to highlight the role of the two major centers of higher artistic education in Portugal, located in the cities of Lisbon and Porto, which, despite their distance, had a similar and synchronized historical context with each other. In 1881, both became institutionally identical, all political and educational decisions became homogeneous and evenly applied. Consequently, the subsequent historical milestones were also common, such as the 1911 Education Reform, where the Schools of Fine Arts were reorganized, and the academies extinguished. Since 1950 the Schools of Fine Arts of Porto and Lisbon are designated as Higher Schools of Fine Arts, where Painting, Sculpture, and Architecture were also taught. However, during the 20th, the difference between the two schools would become more evident. While Lisbon school would continue its academic tradition, in Porto the school would break up with the traditional canons, promoting modernity and the artistic dynamics of the city and the country itself (Ferreira 2015).

— Brief material and technical characterization of the Panel

The Panel "Os Pescadores" is predominantly constituted by a plaster-based paste obtained by a process of calcination of gypsum, a calcareous rock composed mostly of calcium sulfate

dihydrate ($CaSO_4$ $2H_2O$) (Oliveira 2011). It is also characterized by its naturally white color, pigment, and dye free.

Thus, visual inspection suggests that the bas-relief panel was executed in two phases: the first, using the clay modeling technique, and the second, by transposing the clay sculpture to plaster using a lost-form mold.

Regarding the first phase, the author would have sculpted the bas-relief panel on clay, which possibly worked vertically, to facilitate the execution of the figures and motifs, in order to visualize the entire work without perspective distortions. The complexity of the movements and contortion of the volumes of the fishing net that crosses the composition and interacts with several characters, suggests the use of a real model (fishing net) in the sculptural process to produce such a realistic and detailed modeling (J. Füller 1920, 1934).

In the second phase, a plaster mold would have been made, which after consideration of the artistic character of the work and the limited means of execution (inferior quality plaster), is estimated as most likely to have been by means of a waste mold. (J. Füller 1920, 1934).

Waste molds were usually made from a weaker, i.e., less thick, layer of plaster, to which a pigment was added in water, such as almagre, to color the plaster (Ramos 2011). This pigmentation intended to distinguish the original panel from the mold. This method produces a single mold of the piece later destroyed progressively and carefully, by its removal with a chisel until reaching work surface, previously filled with the plaster to form the final piece.

Over the years the panel started to present a dark tone throughout the work (overlapping the layers of dirt), more or less homogeneous, depending on its location. This may be due from the application of a hydrophobic material for the separation of elements when producing cast(s) for replicas. There are small plots of more recent plaster (or later than the original), irregularly and randomly distributed, all over the panel. These plots still present different shades, which alternate between white and pink. The pinkish tone plots may be a consequence of the drawing of lost molds, to the panel itself, or to another object in its proximity (a consequence of the use of the work for workshop classes). The white patches are most likely remains from later castings of the panel, since they show a dark border, thus over dirt stains.

Conservation Intervention of the Plaster Panel

— Literature Review of plaster cleaning

The literature concerning historic plaster's cleaning is not very abundant, and the authors addressing it are all very aware of the sensitivity of the plaster to liquids, especially water (Barclay 2007; Megens *et al.* 2011; Antonio Sansonetti *et al.* 2020; Victoria and Albert Museum 2016; Wolbers & Little 2004). Therefore, the review was oriented to cleaning methods based on the use of agar-agar rigid and viscous gels more suitable for texturized and 3D surfaces (Al-Emam *et al.* 2020; Bertasa *et al.* 2020; Bosch-Roig *et al.* 2015; Costa 2020; Cremonesi 2012; Domingues *et al.* 2013; Espuñes *et al*. 2015; Gilabert Montava 2019; Hernando 2011; Hernando & Domínguez 2013; A Sansonetti *et al.* 2012), alongside with dry methods (Barclay 2007; Klosowska & Obarzanowski 2010; Victoria and Albert Museum 2016).

— Panel conservation state

Structurally, the panel does not show major anomalies with its backside being stable, although a previous repair can be identified in the mid-portion of the panel (side to side) characterized by a continuous application of plaster, which can be considered as the biding of two parts after breakage [Figure 2]. The emphasis is on the amount of soiling accumulated (mainly in hollow areas) during storage, and on the leftover plaster from posterior moldings. Both accumulated by layers and in areas with more pronounced volumes and textures (faces, hairs, and fishing net) that

Figure 2.- Pathology Mapping (Blue: subsequent interventions; Purple: paint droplets; Orange: oxidation stains; Red: Cracks).

deceive the original texture of the piece. The surface shows small cracks and some volumetric gaps without structural expression, and some spots of paint droplets [2] and punctual biological colonization.

— *Cleaning Tests*

The removal of such conflicting and disruptive elements was of major concern in this cleaning process given the brightness, porous and hygroscopic nature of the substrate. These three factors hinder the use of solvents in their liquid form, given the risk of staining or impregnating the grime. To achieve the main criteria of a homogenous color balance within the panel and to restore its reading, the cleaning options ranged from mild mechanical cleaning to gels as asserted by many authors addressing these supports.

Regarding the support and considering the plaster porous and hygroscopic nature it is more susceptible to the deposition and incorporation of dust and dirt. This is in general, aggravated by the action of humidity which allows dust and grime penetration into the substrate (Megens et al., 2011), besides the partial solubility by water (A Sansonetti *et al.* 2012).

The problem was tackled by incorporating the cleaning agents in solid media or in viscous state, towards to prevent major damaging action of solvents in their liquid state. Therefore, a series of systems in gels were selected, to test their cleaning effectiveness.

Effectively, the use of sol-gels is among the most consensual solutions for the cleaning of cultural assets that are particularly sensitive to the action of water (Domingues *et al.* 2013; Espuñes *et al.* 2015; Gilabert Montava 2019; Hernando & Domínguez 2013; Antonio Sansonetti *et al.* 2020).

The advantages of using gel-based cleaning systems are their localised and controlled action of application, hence the prevention of dissemination and impregnation in the support (Domingues et al., 2013), the proper adaptation to smooth surfaces among others with more difficult access and, above all, their ability to imbibe and retain dirt (A Sansonetti *et al.* 2012).

Viscous fluid can provide an adherent thin film that allows the soiling removal by peeling. This technic provides a solution for controlling the amount of water placed on the support and a cleaning method that avoids mechanical stress (Sansonetti *et al.* 2012).

With this in mind, several mixtures were tested [figure 3] in order to assess concentrations (also increasing according to the active principle) and action times. For all this, the cleaning system(s) were considered according to their action on the gypsum substrate (Wolbers & Little 2004).

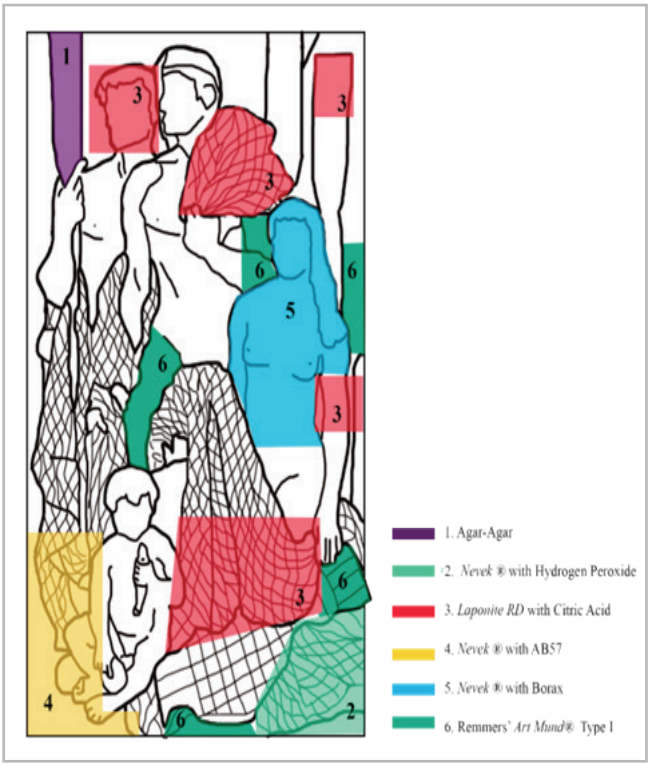

Figure 3.- Cleaning tests mapping. By the authors.

- Agar-agar

Agar-Agar is presented in a powder form, derivative of natural polysaccharide extracted from red algae of the species *Gelidium* and *Gracilariae* that can be used as a peeling gel for cleaning purposes. Mostly used for its gelling agent properties due to the composed polymers of Agarorse and Agaropectin, however only the Agarose has that gelifying property (Hernando 2011; Sansonetti *et al* 2012; Sansonetti 2020).

In recent years, Agar has been commonly used in conservation treatments since it's a versatile medium. As a low cost, thermo-reversible, hydrophilic product and by allowing a time control of the amount of solvent applied, and a more ecological approach both to the artwork and less toxic to the conservator-restorer, turns it in a cleaning agent suitable for its use in hygroscopic materials (Bertasa 2021; Espuñes *et al.* 2015; Hernando 2011; Sansonetti *et al* 2012; Sansonetti 2020). Accordingly, the water acts as a dissolvent while the Agar is the medium and the cleaning is performed by a kinetic energy process occurring in the surface. However, empirically, it can act has a humectant sponge that by capillarity absorbs the dirt (Hernando 2011).

Since, the agar is a powder; it needs to be hydrated to achieve a gel base. The preparation of the gel as soiling collector must be in concentrations between 0.5% to 5% w/v in distilled water (Dóminguez & Hernando 2013; Hernando 2011; Sansonetti *et al.* 2012; Sansonetti 2020). According to Dóminguez & Hernando (2013), the safest

and most effective percentage lies between 2% and 4%, however time of application must be considered within the support condition and type of grime to remove. Once the two components are heated around 80 to 90 ºC, the Agar powder forms a colloidal solution and completely dissolves (Dóminguez & Hernando 2013). With the premise that higher the temperature, the more fluid the mixture will became, regarding tests we can confirm that the mixture starts to become a viscous substance, ideal for application when it reaches 30 - 45 ºC (Dóminguez & Hernando 2013).

During the application, the gel thickness is a factor to have in mind, since it affects the amount of liquid released, and its effectiveness as cleaning agent. If the product is applied for a long period, the thickness must be measured because the agar can dry out. In this panel due to the irregularities of the sculpture, a thin uniform layer was applied with at least 1 mm of thickness (Sansonetti 2020).

After the sol-gel was completely cured (taking about 20 minutes to set), it was removed using flexible spatulas. Since Agar is a biological culture medium, it can be an inducer for biological infestation. For that reason, it's crucial a to assure a total removal of all residues, carried out with increased attention due to the organic traces left behind (Sansonetti 2020; Hernando 2011).

Despite having removed some of the deposits, the results were insufficient, besides being very time consuming. Pre-preparing the mixture plus reheat it until the desired texture it took at least 3 hours.

- Nevek ® with hydrogen peroxide

Since the agar was successful in removing the dirt, a similar product was also used in testing process. Therefore, *Nevek®* is a ready-to-use agar paste stabilized by ethanol and a low amount of isopropanol [3] (1-10%).

This product showed a high effectiveness as a soiling remover, with low adherence to the surface (therefore, easy to remove), and it can be mixed with other products such as organic solvents, chelating agents, surfactants and as a green alternative (Sansonetti 2020). Although the water is the active clean agent, in order to protect the plaster is important to reduce the time of the surface exposure to the mixture. So, in that order, the *Nevek®* preparation (65%) was mixed with a percentage of Hydrogen Peroxide (35%), that could act as a bleaching agent to promote whitening of the surface.

Since the sculpture has an irregular surface, the best way to ensure that all crevasses and indentations were being properly clean, was to apply a thin layer throughout the surface. For that the solution needed to be mixed and heated *in bain-marie* until reaching desired consistency [4]. The application was made using a paint brush and left to dry for 15 minutes. After drying it was removed with flexible spatulas. The result was in unsatisfactory, and despite have removed some of the dirt it was not able to produce a drastic change.

- Laponite RD + Citric Acid

Laponite RD is a powder-cleaning agent constituted by a synthetic silicate that by the process of capillarity absorbs dirt and grease. It is characterized by being an inert, non-flammable, non-toxic compound, non-yellowing and stable at high temperatures. Its main feature lies in its thixotropic property, with very satisfactory results in removing stains and dirt adhered to ceramic and stone supports (Burzio *et al.* 1997; Lai-Mei Lee *et al.* 1997).

The mixture was prepared by using 2 % of *Laponite* RD in 100 ml of distilled water (Conservation Resources, n.d.). Towards to improve the action of the solution, citric acid (Soccol et al., 2006), a mild chelator (Garcia et al. 2013) was gradually added according to the texture we were looking for. To assure the application of a homogeneous layer on the surface, the components were mixed in a double boiler until reaching the gel base consistency. The application was made by semi-rigid spatulas and left to cure for about 20-25 minutes.

As a result, the cleaning process was unsuccessful since it performed a non- homogenous cleaning.

- Nevek ® with AB57

Considering the risk of contamination of the plaster support due to the use of solvents, the commercially prepared aqueous Agar gel, designated as *Nevek®*, was tested by adding a cleaning agent AB57 [5], a detergent developed and studied by the ICR (*Istituto Centrale di Restauro*, Rome).

The gel preparation involved the dissolution of *Nevek®* in distilled water at a ratio of 1:1, followed by the dissolution of detergent AB 57 in water at a ratio of 1:2. After the dissolution of both products, the two solutions were mixed in the following quantities: 50ml Nevek® + 10ml AB 57. The combination of the solutions was made by heating, until they were uniformly diluted (≥ 60 °C).

The gel was applied in a semi-viscous (warm) state in the lower left corner (next to the child figure) using a soft-bristled brush. After 5 minutes, a little of the gel layer was lifted (using a spatula), with no change being observed, and a new poll after 8 minutes, without any visible change either. The subsequent surveys were carried out at intervals of 5 minutes and were always unsuccessful.

After these several treatments, it was possible to conclude that the cleaning using the alkaline detergent AB 57 had no effect. This test also resulted in the conclusion that the

gel, at the performed concentrations becomes too fluid, creating a very thin film, impossible to remove evenly. The residues adhered to the substrate were extensive and their removal was very difficult and time-consuming. As part of the ongoing treatment, its total removal is justified by resorting to a new application of *Nevek®*, this time with a previously tested higher concentration, or even with the addition of polar solvents if necessary (Antonio Sansonetti *et al*. 2020).

- Sodium Borate (BORAX) with Nevek®

The last gel tested was a mixture of *Nevek®*, and Borax, also known as Sodium Borate or sodium tetraborate, an alkaline mineral derived from the mixture of a type of salt with boric acid, easily soluble in water and an off-white powder macroscopic appearance.

This gel was prepared in a *bain-marie*, allowing the homogeneous fusion of both components in a ratio of 1:5, in 10 ml of Borax with 50 ml of Nevek®. The application was carried out in all textured areas or with higher reliefs using spatulas, in a thickness of approximately 2 mm. After acting for 40 to 60 minutes, was removed using spatulas.
After finishing the removal, it was considered that this was the gel with the best results presenting a homogeneous cleaning and easily removable, which were aspects that were not revealed in the previous ones.

- Dry Cleaning System Remmers' Art Mundit® Type I

In addition to chemical cleaning (and after appropriate testing), Remmers' Art Mundit® latex was applied to remove the most adherent dirt [6]. The tests revealed that it was more effective on smooth areas, than in the more textured ones. The unevenness of the application in these textured areas resulted in a faster superficial drying and surface retraction, so it stood out from the contact surface, creating air pockets, and therefore not producing the desired effect. This product turned out to be highly efficient for smoother zones allowing the coverage of extensive areas with a good gripping power of the most adhered grime.

— Performed Intervention in the Panel

After having carried out the chemical cleaning tests and planning the cleaning strategy based on the previous tests the treatment of the panel began.

Firstly, a superficial mechanical cleaning was made with the aim of removing low-adhered dirt. This was carried out through the mechanical action of circular movements using paintbrushes and soft bristle brushes, aided by suction using a low power hoover equipped with a filter at the inlet of the tube (Frade 2018), in order to prevent the collection of material in case of detachment.

As part of the mechanical cleaning, a greyish layer looking like Portland cement, located on the horizontal mesh next to the figure of the child, was also removed, using a scalpel, with the least possible abrasion and positioning the blade as parallel as possible to the surface of the plaster, removing only strange element.

For the chemical cleaning, different methodologies were combined according to the texture of each area of the surface work. In the less textured areas, namely the figures and smooth areas, Art Mundit's® modified latex was used [figure 4 (B)], since it proved a lower efficiency in the more textured areas, namely the fishing net. Thus, in the most textured areas gel composed of 50 ml of Nevek® and 10 ml of Borax was used [Figure 4 (A)].

The chemical cleaning was done by several applications and products removal until a homogeneous cleaning was reached on the whole plaster surface. The *Art Mundit's®* latex treatment was executed using a brush, in order to create a layer of medium thickness and leaving it to dry for

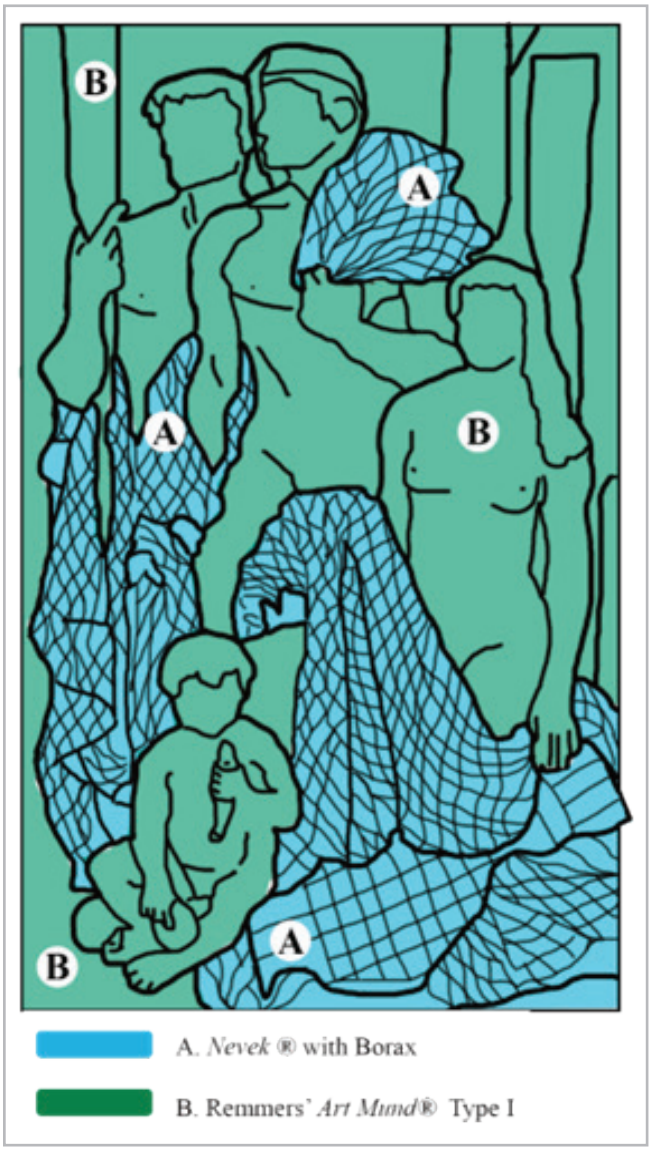

Figure 4.- Mapping of treatments. By the authors.

approximately 3 hours (despite the recommended time is 24 hours), and then removed through the peeling effect, always wearing nitrile gloves. This process, as previously mentioned, was repeated until the desired effect was achieved.

The gel of *Nevek*® with Borax was applied using the same methodology, with the difference that it had to be previously heated at 50-60 ºC, cooled down to desired viscosity and only then applied. To remove this gel, it was necessary to use a spatula, as its adherence to the plaster surface was higher than the latex.

During the various stages of chemical cleaning, a biological infection (fungus) appeared on the surface of the plaster after the use of *Nevek*® and borax [Figures 5-6] since the treatments were being carried in a non-monitored space. Thus, the HR and T fluctuations combined with the covering of the whole panel with bubble wrap created the proper microclimate for a fungal outbreak. The infection was surveyed using a Dino-lite microscope to identify the specimens (not conclusive) but were successfully treated with a double application of 70% ethanol.

Figure 5.- Gel residues. Authors photo.

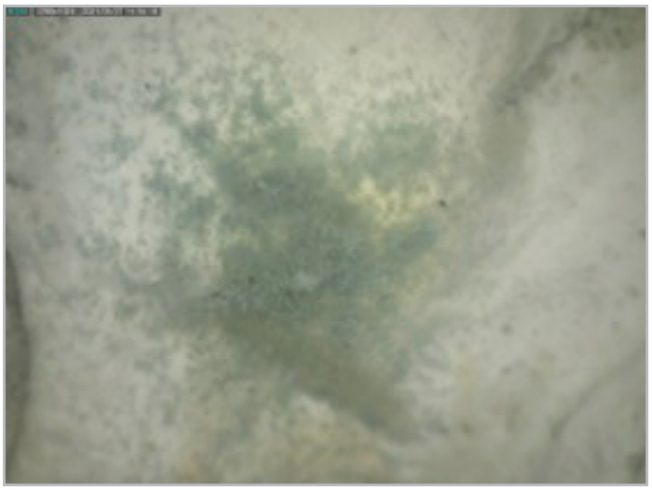

Figure 6.- Fungal infection growing in the residual gel (yellow spot). Authors photo.

Figure 7.- Dry Cleaning System *Remmers' Art Mundit*® Type I. Authors photo.

Figure 8.- Dry Cleaning System with SYRA-Latex 700®.

— Dry Cleaning System with SYRA-Latex 700®

The described performed cleaning tests were undertaken during the academic year of 2020-2021 within the master classes of Techniques of Conservation and Restoration I. Despite the good results obtained previously, there was a need to reach a higher uniformization of the cleaning of the panel. Accordingly, an opportunity to carry out a new cleaning with new product available on the Portuguese market, although with a low rate of trade was available. Thus, the final cleaning of the panel was performed [7]

with the use of dry-cleaning system of SYRA-Latex 700® from ResMonuH. This is a natural latex combined with tensioactiv and thickeners of double action: chemical dissolution and mechanical by posterior fastening with a pH 8. This latex system is targeted to be applied in indoor cleanings of renders, stones and bricks, as well in outdoors (concrete). Three layers of this product were applied with a brush with breaks of 48h between each cleaning since the latex has a break of 24h hours of dryness. One of the great advantages of this product is the green pigment incorporated that becomes changing from the initial white color to green after a short break of its being brushed. This detail is of a huge help to the conservator-restorer compared with the Agar Agar gels, due to its easy removal and the lack of deposits.

As far as it is known this was the first use of this natural dry-cleaning latex on a plaster support representing this paper the first scientific publication to mention and discuss this cleaning system.

Figure 9.- General View of the panel after the intervention. © Luis Nunes.

Results and Discussion. Conclusions

The results obtained during the various cleaning tests revealed the effectiveness of the combination of *Nevek*® gels for textured surfaces (fish net; hair and other small relief elements) and *Remmers' Art Mundit® Type I* latex for smoother elements.

As far as the *Nevek*® gels are concerned, their application with a brush at higher temperatures (almost liquid) proved to be difficult to remove, so the product was applied at temperatures between 20-30 ºC (slightly above room temperature) with a spatula in thick poultices (2-3 mm), which resulted to be easier to remove and with quite reasonable cleaning effects.

By other hand, concerning the *Remmers' Art Mundit® Type I* latex and analysing the company specifications, that recommends waiting 24 hours for the latex to dry, it did not prove to be effective, so the applied layers were removed after 3 hours, with very satisfactory results.

The use of SYRA-Latex 700® from ResMonuH presented very good results in the removal of the deepest adhered dirts, especially those located in the lower relief areas (dark and grey zones) and of the remains of the Agar Agar gel encrusted in the relief details. This last performance allowed to reach an uniform cleaning of the all panel which is relevant to its aesthetic fruition.

The "Pescadores" panel proved that the cleaning of plaster artworks is still posing challenges that must be faced with previous research towards finding the most suitable approaches to improve the efficiency of the available methods and products. The texture and relief of surfaces, the type of dirt adhered, as well their depth of penetration in the support are relevant parameters to be taken in consideration.

Notes

[1] This plaster panel was treated within the workshop classes of the curricular unit of Conservation and Restoration Techniques I, of the Master of Conservation and Restoration of Cultural Assets of the School of Arts of the Universidade Católica Portuguesa in the curricular year of 2020-2021.

[2] Probably *almagre* colored plaster that was commonly used to distinguish the positive from the negative when casting (Josef Füller, n.d.).

[3] According to the datasheet, in: https://shop-espana.ctseurope.com/documentacioncts/fichastecnicasweb2018/3.1disolventes2016/nevekesp.pdf (2021/07/28).

[4] Considering that *Nevek's*® main ingredient is Agar-agar, we can assume that to acquire a viscous texture it needs to range in temperature between 30-45ºC (Dóminguez & Hernando, 2013).

[5] Basic formula: 1) Water:1000 cc; 2) Ammonium bicarbonate: 30 g; 3) Sodium bicarbonate: 50 g; 4) EDTA (disodium salt): 25 g; 5) Quaternary ammonium salt at 10%: 10 cc; 6) Carboxymethylcellulose: 60 g. As specified in in: http://www.brescianisrl.it/newsite/ita/xprodotto.php?id=4160&hash=9d8ab216aab8339529a858c6d5267583 (2021/07/29).

[6] According to Klosowska, A., & Obarzanowski, M. (2010). Plaster casts in the collection of The National Museum in Krakow. *Conservation issues. Plaster Casts of the Works of Art: History of Collections, Conservation, Exhibition Practice,* 103–112. In: https://www.researchgate.net/publication/264741661_Plaster_casts_in_the_collection_of_the_National_Museum_in_Krakow_Conservation_issues.

[7] Within the workshop classes of the Conservation Restoration Bachelor of the academic year of 2021-2022.

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Inês Rosa, graduated in Conservation and Restoration of Cultural Heritage from the Portuguese Catholic University, has an accumulated 15 years of experience in various cultural heritage C&R projects. She is currently finishing her master's thesis in Conservation and Restoration of Cultural Heritage, in the field of Built/Integrated Heritage, with the theme of Rehabilitation of Civil Buildings in Porto, where she analyses the changes in the city buildings since 2015, based on the sustainable trinomial: Preventive Conservation, Circular Economy, and Energy Efficiency. This research, aiming for a Heritage Observatory is part of the HAC4CG - Heritage, Art, Creation for Climate Change project. Living the City: Catalysing Spaces for Learning, Creation, and Action towards Climate Change, developed by the Research Centre in Science and Technology of the Arts (CITAR-UCP), which has climate change as its central theme, seeking to involve citizens in responding to this issue.

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Mariana Nobre Durana Pinto (born in Vila Nova de Gaia in 1999) has a degree in Art-Conservation and Restoration (2020) and a master's degree in Conservation and Restoration of Cultural Heritage (2023) from the School of Arts at the Portuguese Catholic University. Her research focuses on archaeological heritage, with an emphasis on the conservation of archaeological sites, which resulted in the writing of her master's thesis entitled "Levantamento das Políticas de Conservação aplicadas a Sítios Arqueológicos, em Portugal (1950-2022): Análise e Interpretação de 8 Casos de estudo Luso-romanos", under the guidance of Professor Eduarda Vieira and Professor José d'Encarnação. This study has already allowed her to participate in two scientific meetings: the III EJI-PATER (Guimarães, 2022), with an oral presentation; and the JIP (Madrid, 2023), with the presentation of a scientific poster. Professionally, she currently collaborates with the company Arqueologia e Património Lda. (based in Matosinhos, Porto) as a junior conservator-restorer in its internal staff. This collaboration has allowed her to develop and consolidate her practical and theoretical skills in the conservation and restoration of inorganic/archaeological materials (the company's area of activity).

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Mariana Cruz da Costa (Barcelos, 1999), is a Restoration Conservator by School of Arts - Universidade Católica Portuguesa specialized in Conservation of Natural Science Collections. Her Master's in Conservation and Restoration of Cultural Property by UCP (2023) research entitled Glossário de Patologias em Taxidermias de Espécimes Vertebrados: Um caso de estudo nas coleções do Museu de História Natural e da Ciência da Universidade do Porto (MHNC-UP), approaches an illustrated glossary addressing the basic concepts for the description and identification of conservation problems present in taxidermy specimens. Her case study was the collection of the Museum of Natural History and Science of the University of Porto (MHNC-UP), to which she collaborated as a trainee in the department of Conservation and Restoration between 2020/2022. Furthermore, her dissertation allowed her research to be presented during the 2022 SPNHC conference in Edinburgh.

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Marta Lopes Dias Borges was born in 1999, in Porto, Portugal. From an early age, she showed an interest in art and its preservation, which led her to pursue a career in conservation and restoration. After completing her secondary education in Art, Marta enrolled in the School of Arts of the Portuguese Catholic University of Porto, where she obtained a degree in Conservation and Restoration of Art Following her graduation, Marta pursued a master's degree in Conservation and Restoration of Art with specialization in built heritage, also at the School of Arts of the Portuguese Catholic University of Porto. Her thesis entitled "Reintegração cromática de Azulejaria de Fachada com tintas da marca CIN – estudo experimental em duas fachadas no Norte de Portugal". This specialization allowed her to refine her skills in

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Sofia Perestrelo Sampaio Oliveira (Vila Nova de Gaia, 1999) has a degree (2020) and a master degree (2023) in Conservation and Restoration from the School of Arts of the Portuguese Catholic University of Porto. Her area of interest is natural history collections, and her dissertation used the osteological collection of the Museum of Natural History and Science of the University of Porto as a case study, with the aim of creating an illustrated glossary of the pathologies that are possible to find in these collections. The name of her dissertation is "Patologias associadas à coleção osteológica do Museu de História Natural e da Ciência da Universidade do Porto. Levantamento e Definição" and at the same time she was a trainee in the Museum where she deepened and improved her knowledge about these collections and how to conserve them. She also had the opportunity to present her dissertation at the international conference Society for the Preservation of Natural History Collections 2022 in Edinburgh.

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