NANORESTORE GEL® DRY

Technical Sheet

OVERVIEW

Nanorestore Gel® Dry are water-based chemical gels, which leave no residues on the surface of the treated artifacts. Thanks to their highly retentive network they can be used also on water-sensitive surfaces because their action is limited to the interface, thus only a small amount of liquid is released to the surface. Nanorestore Gel® Dry are sold loaded with water, but they can be also loaded with polar solvents (such as ethanol) or water-based nanostructured fluids of the Nanorestore Cleaning® series.

AVAILABLE FORMULATIONS

Nanorestore Gel® Medium Water Retention - MWR (formerly known as "Extra Dry"):

Transparent chemical hydrogel based on a pHEMA/PVP semiinterpenetrated network having very high retention of loaded liquid. Can be safely used on particularly water-sensitive substrates. Each package contains a water-loaded sheet (approx. 10 cm x 15 cm x 2 mm), which can be reused up to 5 times, depending on the specific case.

Nanorestore Gel® High Water Retention - HWR (formerly known as "Max Dry"):

Transparent chemical hydrogel based on a pHEMA/PVP semiinterpenetrated network having the maximum retention of loaded liquid. Can be safely used on substrates that cannot tolerate water. Each package contains a water-loaded sheet (approx. 10 cm x 15 cm x 2 mm), which can be reused up to 5 times, depending on the specific case.

WHEN ARE THEY USED?

Cleaning of water-sensitive (painted) surfaces is a very delicate operation, since detergent systems have to perform a selective and controlled action to remove grime, dirt and/or aged varnishes without affecting the original materials and/or the underlying pictorial layer. Gels are usually used for this purpose. Traditional gelled systems offer quite good performances, but their nature makes them very hard to be removed from the cleaned surface and might produce irreversible damages to the pictorial layer. Nanorestore Gels® Dry are designed to overcome the limits of traditional gels.

OK to be used for

✔ Removal of hydrosoluble dirt, grime or dust from canvas paintings
✔ Removal of hydrosoluble dirt, grime or dust from paper (pay attention to the presence of hydrosoluble inks or pigments)
✔ Removal of hydrosoluble dirt, grime or dust from paintings on wood
✔ Removal of hydrosoluble dirt, grime or dust from parchment or leather
✔ Removal of aged varnishes from canvas paintings (in this case Nanorestore Gels® Dry need to be loaded with solvents or Nanorestore Cleaning® formulations)
✔ Removal of (aged) adhesives or polymeric coatings from paper or other water-sensitive materials

✖ ***For different applications, it is advised to contact us for assistance. We will be glad to help you in finding the best solution for your conservative need***

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E-mail: *products@csgi.unifi.it*

HOW DO THEY WORK?

They are used as vehicle (containers) for the liquid cleaning agent. Nanorestore Gels® Dry can remove grime, dirt and/or aged varnishes by solubilization or swelling/detachment of unwanted material. They prevent the cleaning agent from fast evaporation and uncontrolled penetration into porous materials making the cleaning safer. Moreover, thanks to their formulation they do not leave residues on the treated surfaces.

HOW ARE THEY USED?

General features

Nanorestore Gel® Dry can be used loaded with water, aqueous solutions, several solvents or waterbased nanostructured fluids of the Nanorestore Cleaning® series.

Storage

Nanorestore Gel® Dry are shipped immersed in a small volume of demineralized water. The gels are stable, and can be conserved at room temperature for several months before the use. When gels are removed from the original packages they should be stored immersed in water in closed containers, kept in the dark. Wait at least 24 hours before the first usage. It is advisable to check gels after long a storage time, in order to verify that no alteration has occurred. Though the gels should be quite resistant to microorganisms, they can be subjected to biological contamination, if not properly handled. In case a biological attack is noticed, the gels can be washed with a 1% sodium hypoclorite solution for 1-2 minutes, carefully rinsed with water in order to remove the hypoclorite, and stored in clean water. Before the use, make sure that biological contamination was completely removed from the gels.

Safety

Nanorestore Gel® Dry are non-toxic, thus they can be handled with standard laboratory gloves according to common laboratory practice. When solvent-loaded gels are used, we recommend to follow all the standard precautions related to the use of organic solvents, even if when solvents are confined into the gels, their volatility is reduced, therefore the exposition of the user to solvent vapors is decreased.

Application

When Nanorestore Gel® Dry are removed from their container (or their original package), they can be cut down and shaped in the desired size and form. Then, prior to application, water excess on the gel surface has to be removed by gently placing for 1-2 seconds each side of the gel on a sheet of absorbing paper (**Fig. 1a.1** or **Fig. 2a.2**). Finally, the gel can be applied on the surface to be treated (**Fig. 1a.2** or **Fig. 2a.3**). Just lay the gel on the surface that has to be cleaned, using hands or tweezers, and apply a little pressure, in order to optimize the adhesion of the gel to the surface.

Reducing evaporation (optional)

If needed, a plastic film can be placed over Nanorestore Gels® Dry keep the gel wet during the cleaning operation, reducing the evaporation of water (**Fig. 1a.3** or **Fig. 2a.4**). It is worth noting that in case of standard operations, this procedure is not needed, being the application time short if compared to the evaporation time of water confined in gel network.

Application time

Application time strongly depends on the type of gel, the materials to be removed and the surface from which they should be removed. In general, the application time can vary from a minute up to 3-4 hours (**Fig. 1a.4** or **Fig. 2a.5**). In the case of long application, it is mandatory to protect the gel from water evaporation, in order to avoid the drying of Nanorestore Gel® Dry (see above).

Removal

Nanorestore Gels® Dry can be removed from the treated surface by using tweezers or by delicately peeling the gel (**Fig. 1b.5** or **Fig. 2b.6**).

Mechanical action

If the application of Nanorestore Gels® Dry leads to the swelling of grime, dirt and/or aged varnishes, the removal of swollen and soften materials should be carried out by a gentle mechanical action (e.g. using a swab) (**Fig. 1b.6b** or **Fig. 2b.7b**). On the other hand, when unwanted material is solubilized, the mechanical action is not needed, being the dirt/grime entrapped into the gel network (**Fig. 1b.6a** or **Fig. 2b.7a**).

Repeated applications

Nanorestore Gels® Dry can be used in a single application or in short repeated applications. In this case, it is important to check if gel is still humid before re-applying it. If not, it is advisable to use another piece of gel, following the procedure described into the “Application” section.

Reusing the gel

Nanorestore Gel® Dry can be used several times after the first application, provided that they are immersed in water overnight or at least for 12h, to re-load pure water and release dirt/grime (**Fig. 1b.8**). For instance, Nanorestore Gels® Dry can be used up to 4-5 times for the removal of dirt and dust. However, it is worth noting that the cleaning effectiveness might decrease after each application. Long-term storage of Nanorestore Gels® Dry following the first use is not advisable.

Loading of solvents or other liquids

Loading Nanorestore Gels® Dry with solvents (e.g. glycols, alcohols, ethanolamine), water-solvent blends (e.g. water and ethanol) or Nanorestore Cleaning® aqueous formulations can be carried out by immersing the original water-loaded gel into the desired cleaning fluid for at least 12 hours (**Fig. 2a.1**). The gel can be reused up to 5 times, by re-immersing it into the solvent or Nanorestore Cleaning® formulation. Please note that, once loaded, gels cannot be immersed in water or in other cleaning fluids (i.e., they should be stored in the loaded cleaning formulation).

List of chemicals that **can** be loaded into Nanorestore Gel® Dry:

✔ Benzyl alcohol
✔ Acetic acid
✔ Ethylene glycol
✔ 2-Methoxyethanol (Methyl cellosolve)
✔ Ethanolamine
✔ Propylene glycol
✔ Ethanol
✔ Methanol
✔ 2-Butanol
✔ 2-Propanol

List of chemicals that **cannot** be loaded into Nanorestore Gel® Dry:

✖ Acetone
✖ Butyl Acetate
✖ Cyclohexane

✖ Ethyl acetate
✖ Heptane
✖ Methyl ethyl ketone
✖ 1-Pentanol
✖ Propylene carbonate
✖ Toluene
✖ Xylene

Final clearance

After the application of Nanorestore Cleaning®-loaded gels, a final clearance can be carried out using Nanorestore Gels® Dry simply loaded with water, aimed at removing water-soluble non-volatile components, which in some cases might remain as a residue over the treated surface.

APPLICATION GUIDELINES AT A GLANCE

Goggles	No
Gloves	Yes
Ventilated hood or environment	Only if loaded with solvents
Application time	1-5 minutes (to 3-4 hours), depending on the specific case
Residues after cleaning	Possibly surfactants, only if loaded with Nanorestore Cleaning® formulations
Final clearance	Rinse with water (or apply a water-loaded gel) if surfactants residues can be present, only if Nanorestore Cleaning®-loaded gels have been used

FIGURES

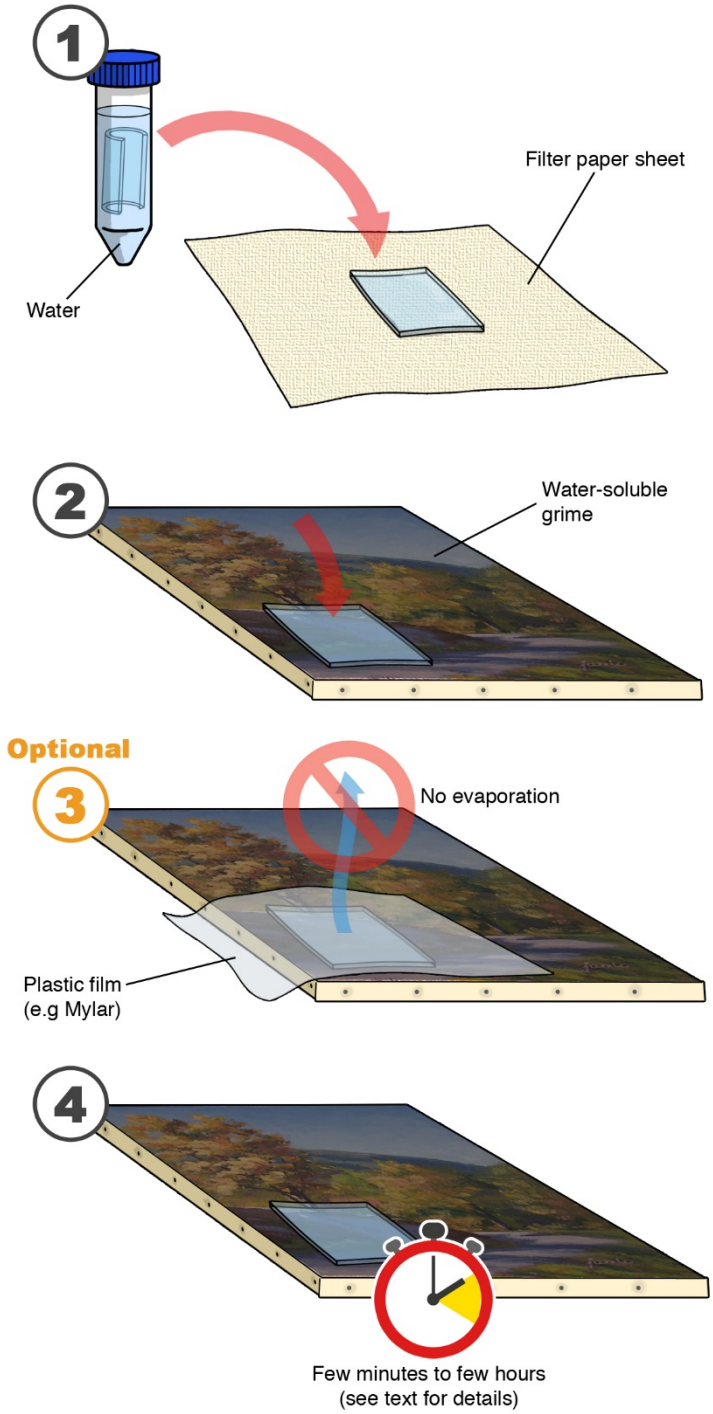

Figure 1a. Application of Nanorestore Gel® Dry for the removal of hydrosoluble dirt.
(1) Water excess on the gel surface has to be removed by gently placing for 1-2 seconds each side of the gel on a sheet of absorbing paper
(2) Place the gel over the surface.
(3) Use a plastic film to avoid liquid evaporation. (Optional)
(4) Application time ranges from few minutes to 3-4 hours.

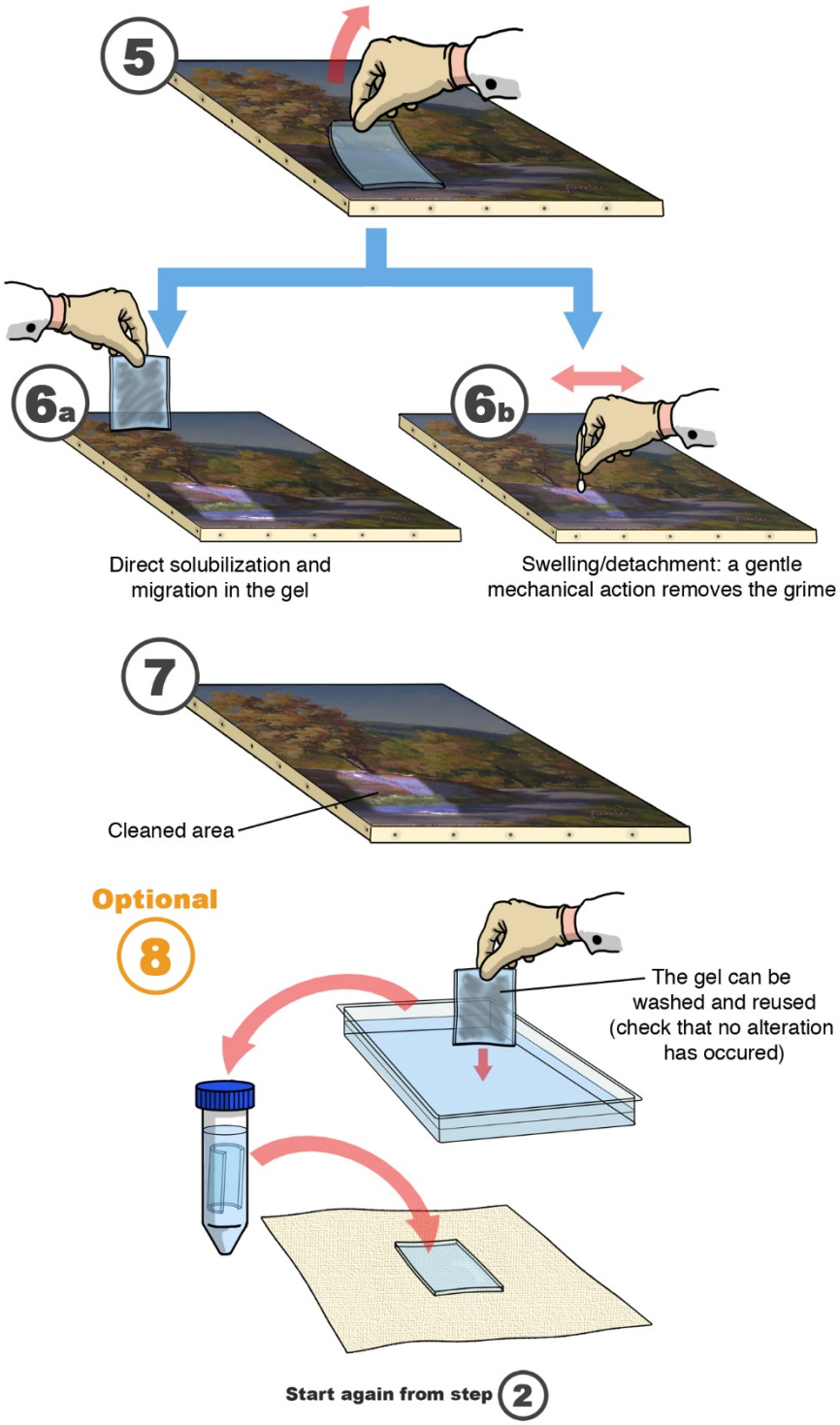

Figure 1b. Application of Nanorestore Gel® Dry for the removal of hydrosoluble dirt.
(5) Remove the gel.
(6) When the unwanted material is solubilized, a mechanical action is not needed, being the dirt/grime entrapped into the gel network (a). If the application leads to the swelling of grime or dirt, the removal of swollen and soften materials should be carried out by a gentle mechanical action (e.g. using a swab) (b).
(7) The treated area is now clean.
(8) The gel can be reused up to 5 times, by re-immersing it in water.

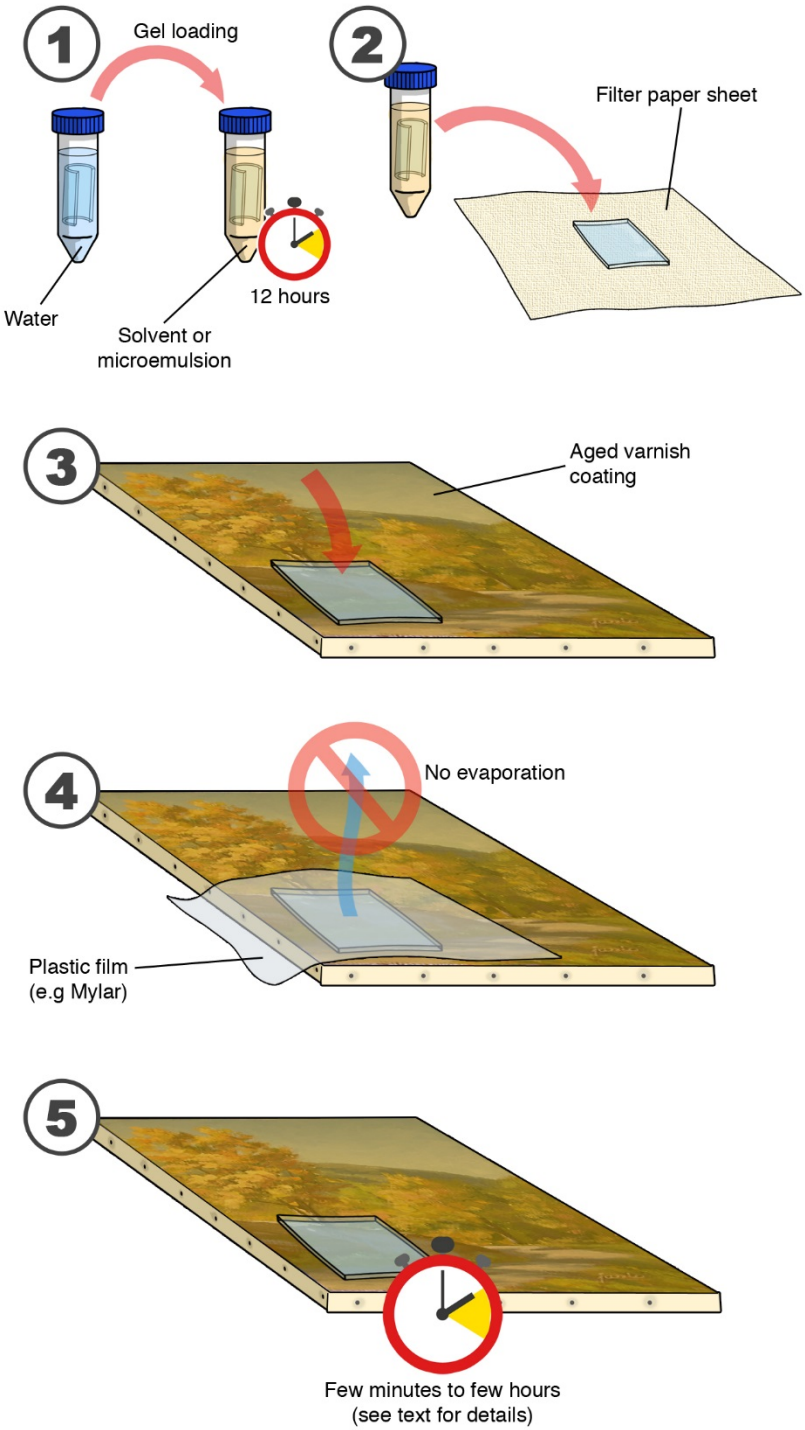

Figure 2a. Application of Nanorestore Gel® Dry (loaded with solvents or Nanorestore Cleaning® formulations) for the removal of polymeric coatings or varnishes.
(1) Loading Nanorestore Gels® Dry with solvents (e.g. glycols, alcohols, ethanolamine), water-solvent blends (e.g. water and ethanol) or Nanorestore Cleaning® aqueous formulations can be carried out by immersing the original water-loaded gel into the desired cleaning fluid for at least 12 hours
(2) Liquid excess on the gel surface has to be removed by gently placing for 1-2 seconds each side of the gel on a sheet of absorbing paper
(3) Place the gel over the surface.
(4) Use a plastic film to avoid liquid evaporation. (Mandatory in this case.)
(5) Application time ranges from few minutes to 3-4 hours.

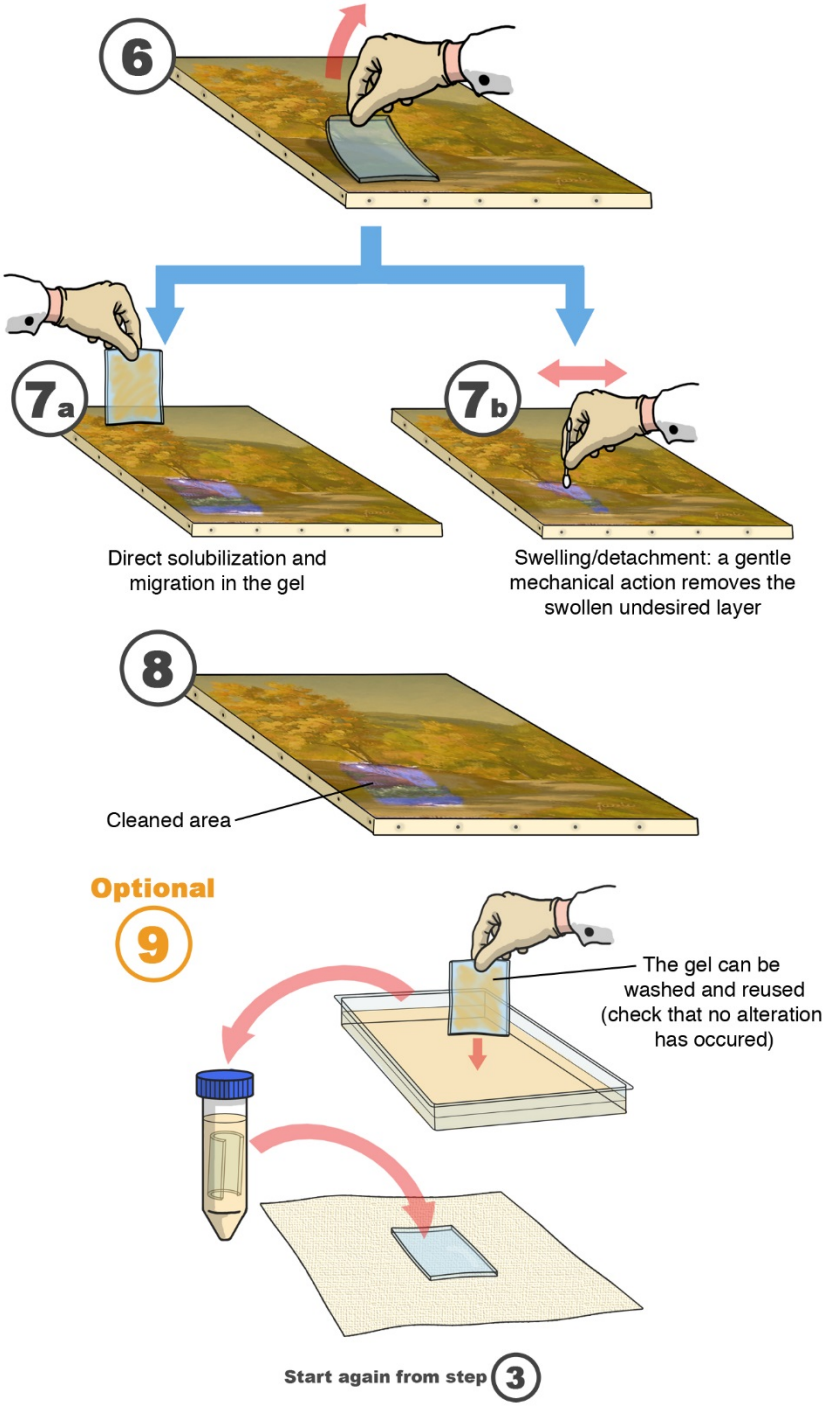

Figure 2b. Application of Nanorestore Gel® Dry (loaded with solvents or Nanorestore Cleaning® formulations) for the removal of polymeric coatings or varnishes.
(6) Remove the gel.
(7) When the unwanted material is solubilized, a mechanical action is not needed, being the dissolved material entrapped into the gel network (a). If the application leads to the swelling of the polymeric coating and/or aged varnishes, the removal of swollen and soften materials should be carried out by a gentle mechanical action (e.g. using a swab) (b).
(8) The treated area is now clean.
(9) The gel can be reused up to 5 times, by re-immersing it into the solvent or Nanorestore Cleaning® formulation.

FREQUENTLY ASKED QUESTIONS

Q I forgot to put back into the container the Nanorestore Gel® Dry and now it is completely dried. Can I reuse it, if rehydrated?

A No, completely dried gel cannot be reused, even if rehydrated. As a matter of fact, the complete drying of Nanorestore Gel® Dry could affect the cleaning effectiveness of the system.

REFERENCES

Further information can be found in the following textbooks:

1. Piero Baglioni e David Chelazzi. *Nanoscience for the Conservation of Works of Art*. Royal Society of Chemistry, 2013.

2. Piero Baglioni, David Chelazzi e Rodorico Giorgi. *Nanotechnologies in the Conservation of Cultural Heritage: A Compendium of Materials and Techniques*. Springer, 2014.

For technical questions:

assistance@csgi.unifi.it

For placing an order or for administrative support:

products@csgi.unifi.it

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NANORESTORE GEL® PEGGY

Technical Sheet

OVERVIEW

Nanorestore Gel® Peggy are hydrogel for cleaning and/or controlled humidification of surfaces characterized by strong intermolecular bonds, which guarantee their physical consistency (they have their own shape) and the absence of gel residues after cleaning. Thanks to their retentive network, the liquid contained in them is slowly released to the surface. Nanorestore Gel® Peggy are highly flexibile and elastic, allowing for the application even on rough and/or irregular surfaces. Nanorestore Gel® Peggy are sold loaded with water, but they can be also loaded with hydroalcoholic mixtures (water/ethanol, etc.) or water-based nanostructured fluids of the Nanorestore Cleaning® series.

AVAILABLE FORMULATIONS

Nanorestore Gel® Peggy 5: Opalescent hydrogel based on poly (vinyl alcohol) polymeric network. The gel, flexible and elastic, adheres well even on rough and irregular surfaces. Each package contains a water-loaded sheet (approx. 10 cm x 15 cm x 2 mm), which can be reused up to 5 times, depending on the specific case.

Nanorestore Gel® Peggy 6: Opalescent hydrogel based on poly (vinyl alcohol) polymeric network. The Peggy 6 gel is even more flexible, elastic, having lower retention of loaded liquid than Peggy 5; this is why it adheres particularly well to very rough and irregular surfaces. Each package contains a water-loaded sheet (approx. 10 cm x 15 cm x 2 mm), which can be reused up to 5 times, depending on the specific case.

Nanorestore Gel® Peggy 5 Gum: Opalescent hydrogel based on poly (vinyl alcohol) polymeric network. The gel is supplied in parallelepiped shape (approx. 12 cm^3). It allows to associate controlled and localized humidification with a light mechanical action and can be used as a sort of ultra-delicate eraser for the removal of surface dirt.

Nanorestore Gel® Peggy 6 Gum: Opalescent hydrogel based on poly (vinyl alcohol) polymeric network. The gel is supplied in parallelepiped shape (approx. 12 cm^3). It allows to associate controlled and localized humidification with a light mechanical action and can be used as a sort of ultra-delicate eraser for the removal of surface dirt.

Nanorestore Gel® Peggy 5 Pen: Opalescent hydrogel based on poly (vinyl alcohol) polymeric network. The gel has a pen shape of about 8 cm length and 1.5 cm diameter. It allows for a controlled and localized humidification with a light mechanical action and can be used as a sort of ultra-delicate eraser for the removal of surface dirt.

Nanorestore Gel® Peggy 6 Pen: Opalescent hydrogel based on poly (vinyl alcohol) polymeric network. The gel has a pen shape of about 8 cm length and 1.5 cm diameter. It allows for a controlled and localized humidification with a light mechanical action and can be used as a sort of ultra-delicate eraser for the removal of surface dirt.

WHEN ARE THEY USED?

The Nanorestore Gel® Peggy are useful when a controlled release of cleaning/detergent systems on a surface is necessary. Limiting the action of the cleaning systems used (water, solvents, micellar solutions, microemulsions, etc.) to the interphase gel/surface allows a more selective and controlled action during the removal of grime, dust and/or aged varnishes, reducing the risk of damaging the original materials and/or the underlying pictorial layer. Unlike the most common thickeners, used to increase the viscosity of liquids, gels can be considered as "containers", which allow to put the cleaning fluid in contact with the surface to be treated. Moreover, the gel can be removed from the surface by using tweezers or by delicately peeling the gel, without the need to perform a potentially harmful mechanical action on the substrate.

Ok to be used for

✓ Removal of hydrosoluble dirt, grime or dust from canvas painting and in particular from irregular surfaces.
✓ Removal of hydrosoluble dirt, grime or dust from painting on wood.
✓ Removal of hydrosoluble dirt, grime or dust from textile articles.
✓ Removal of stains and patches from paper.
✓ Removal of aged varnishes from canvas paintings (in this case Nanorestore Gel® Peggy should be loaded with solvents or Nanorestore Cleaning® formulations).

More detailed information on the use and application of gels are provided in the following sections of this technical data sheet.

✖***For different applications, it is advised to contact us for assistance. We will be glad to help you in finding the best solution for your conservative need.***

E-mail: *products@csgi.unifi.it*

HOW DO THEY WORK?

They are used as vehicle (containers) for the liquid cleaning agent. They prevent the cleaning agent from fast evaporation and uncontrolled penetration into porous materials making the cleaning safer. Moreover, thanks to their formulation they do not leave residues on the treated surface.

HOW ARE THEY USED?

General features

Nanorestore Gel® Peggy can be used loaded with water, aqueous solutions or water-based nanostructured fluids of the Nanorestore Cleaning® series.

Storage

Nanorestore Gel® Peggy are shipped immersed in a small volume of demineralized water. The gels are stable, and can be conserved at room temperature for several months before the use. When gels are removed from the original packages they should be stored immersed in water in closed containers, kept in the dark. Wait at least 24 hours before the first usage. It is advisable to check gels after long a storage time, in order to verify that no alteration has occurred. Though the gels should be quite resistant to microorganisms, they can be subjected to biological contamination, if not properly handled. In case a biological attack is noticed, the gels can be washed with a 1% sodium hypoclorite solution for 1-2 minutes, carefully rinsed with water in order to remove the hypoclorite, and stored in clean water. Before the use, make sure that biological contamination was completely removed from the gels.

However, it is advisable to handle the gels with clean gloves and carefully separate gels for long period storage and gel for immediate use (it may be useful for this purpose to take the amount of gel intended for daily use and store it in dedicated containers).

Safety

Nanorestore Gel® Peggy are non-toxic, thus they can be handled with standard laboratory gloves according to common laboratory practice. When solvent-loaded gels are used, we recommend to follow all the standard precautions related to the use of organic solvents.

Loading of solvents or other liquids

Loading Nanorestore Gel® Peggy with aqueous solutions (TAC, chelating agents), water/alcohol blends (e.g. water/ethanol) or Nanorestore Cleaning® aqueous formulations can be carried out by immersing the original water-loaded gel into the desired cleaning fluid for at least 12 hours (**Fig. 2a.1**). The gel can be reused up to 4-5 times, by re-immersing it into the solvent or Nanorestore Cleaning® formulation. Please note that, once loaded with a different liquid than water, gels cannot be immersed in water or in other cleaning fluids (i.e., they should be stored in the loaded cleaning formulation).

✖ ***Attention: for the hydroalcoholic mixtures, the alcohol content can not exceed 50% v/v.***

Application

When Nanorestore Gel® Peggy are removed from their container (or their original package), they can be cut down and shaped in the desired size and form. Then, prior to application, water excess on the gel surface has to be removed by placing the gel between two sheets of absorbent material (e.g., absorbing paper) and exert a light pressure with hands. After this operation, the gel surface will be dry and the gel can be applied on the surface to be treated. Just lay the gel on the surface that has to be cleaned, apply a little pressure with a finger or a suitable laboratory tool in order to optimize the adhesion of the gel and remove any air bubbles between the gel and the surface.

Application time

Application time strongly depends on the type of gel, the materials to be removed and the surface from which they should be removed. In general, the application time can vary from a minute up to several hours (**Fig. 1a.4** or **Fig. 2a.5**). In the case of long application, it is mandatory to protect the gel from water evaporation, in order to to avoid the drying of Nanorestore Gel® Peggy.

✖ ***In order to evaluate the optimum application time it is recommended to perform some preliminary tests on small areas. In many cases repeated short applications can be more effective and ensure greater control than a single prolonged application.***

Reducing evaporation (optional)

If needed, a plastic film can be placed over Nanorestore Gel® Peggy to keep the gel wet during the cleaning operation, reducing the evaporation of water (**Fig. 1a.3** o **Fig. 2a.4**). it is worth noting that in case of standard operations, this procedure is not needed, being the application time short if compared to the evaporation time of water confined in gel network.

Removal

Nanorestore Gel® Peggy can be removed from the treated surface by using tweezers or by delicately peeling the gel (**Fig. 1b.5** o **Fig. 2b.6**).

Removal of unwanted materials

Depending on the type of material to be removed from the surface and on the type of cleaning fluid used, various phenomena may occur after the application of Nanorestore Gel® Peggy:

- the unwanted material is solubilized and migrates directly into the gel (**Fig. 1b.6a** o **Fig. 2b.7a**).
- it is observed a swelling of grime, dirt and/or aged varnishes; in this case the removal of swollen and soften materials can be carried out by means of a gentle mechanical action (e.g. using a swab) (**Fig. 1b.6b** o **Fig. 2b.7b**).

Repeated applications

Nanorestore Gel® Peggy can be used in a single applicatin or in short repeated applications. In this case, it is important to check if the gel is still humid before re-applying it. If not, it is advisable to use another piece of gel, following the procedure described into the “Application” section.

Reusing the gel

During cleaning operations, Nanorestore Gel® Peggy can be used on both sides. In addition to that, Nanorestore Gel® Peggy can be used several times after the firs application, provided that they are immersed in water overnight or at least for 12h, to re-load pure water and release dirt/grime (**Fig. 1b.8**). For instance, Nanorestore Gel® Peggy can be used up to 4-5 times for removal of dirt and dust. However, it is worth noting that the cleaning effectiveness might decrease after each application. Long-term storage of Nanorestore Gel® Peggy following the first use is not advisable.

Final clearance

After the application of Nanorestore Cleaning®-loaded gels, a final clearance can be carried out using Nanorestore Gel® simply loaded with water, aimed at removing water-soluble non volatile components (surfactants), which in some cases might remain as residue over the treated surface. This operation generally requires a short application of few minutes.

APPLICATION GUIDELINES AT A GLANCE

Goggles	No
Gloves	Yes
Ventilated hood or environment	Only if loaded with solvents
Application time	1-5 minutes to a 3-4 hours, depending on the specific case
Residues after cleaning	Possilbly surfactants, only if loaded with Nanorestore Cleaning® formulations
Final clearence	Rinse with water (or apply a water-loaded gel) if surfactant residues can be present.

FIGURES

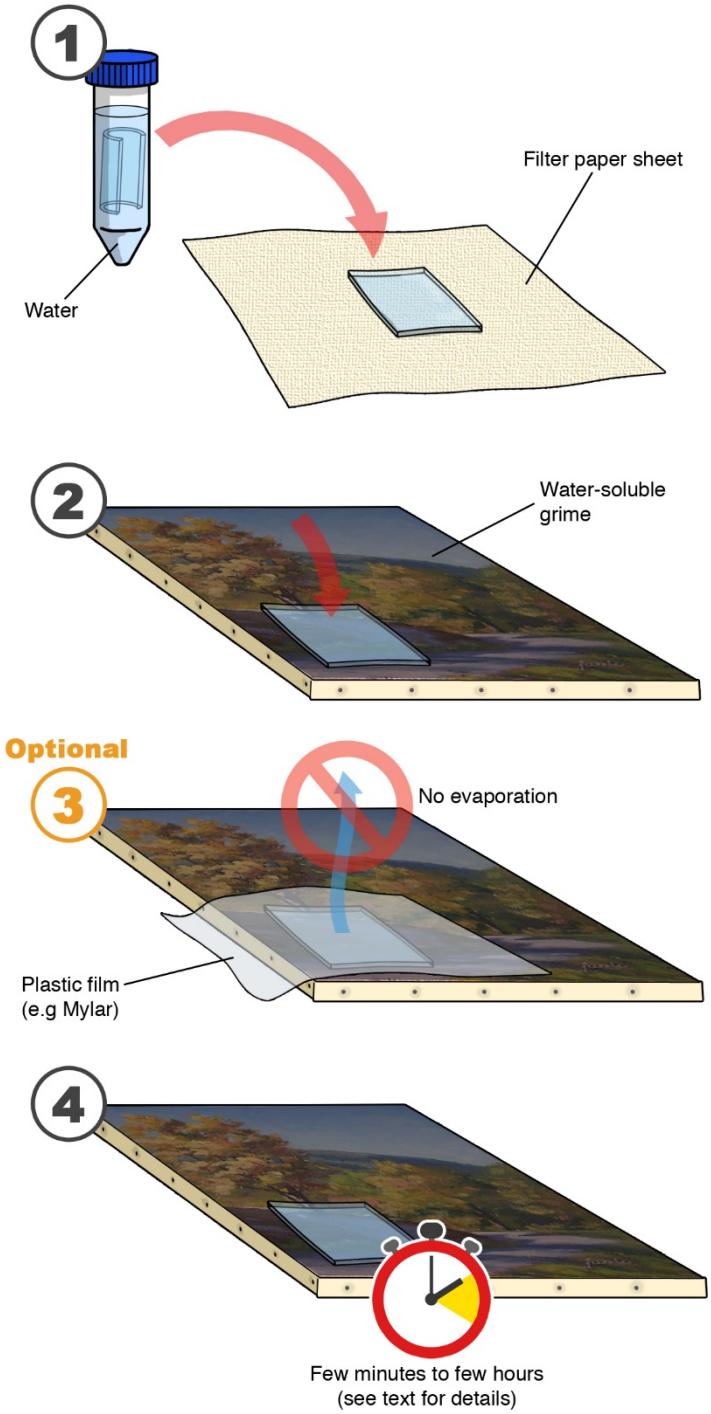

Figure 1a. Application of Nanorestore Gel® Peggy for the removal of hydrosoluble dirt.
(1) Water excess on the gel surface has to be removed by gently placing the gel between two sheets of adsorbing paper. The surface of the gel should appear dry.
(2) Place the gel over the surface.
(3) Use a plastic film to avoid evaporation. (Optional)
(4) Application time ranges from a minute to 3-4 hours.

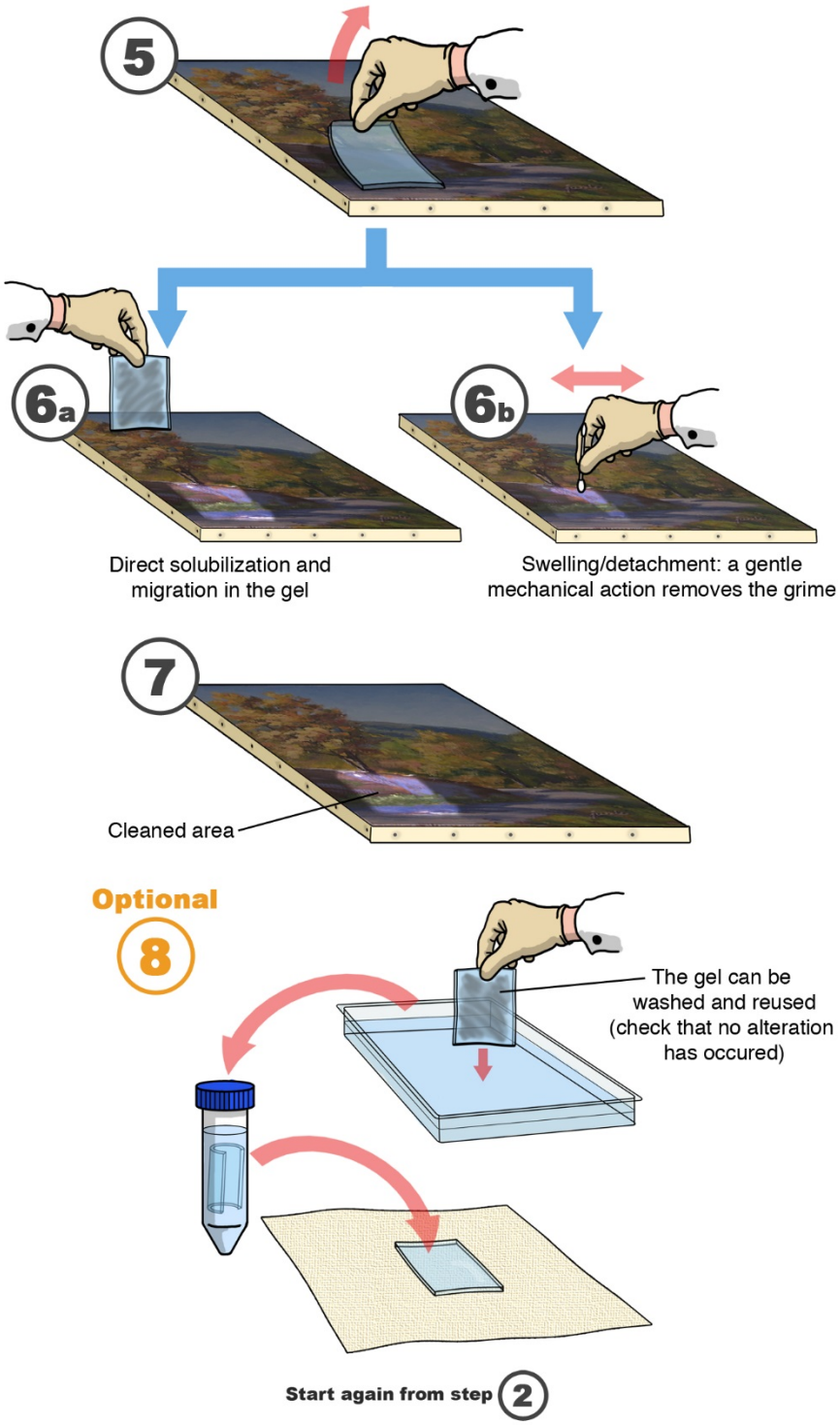

Figure 1b. Application of Nanorestore Gel® Peggy for the removal of hydrosoluble dirt.
(5) Remove the gel.
(6) When the unwanted material is solubilized, a mechanical action is not needed, being the dirt/grime entrapped into the gel network (a). if the application leads to the swelling of grime or dirt, the removal of swollen and soften materials should be carried out by gentle mechanical action (e.g. using a swap) (b).
(7) The treated area is now clean
(8) the gel can be reused up to 5 times, by re-immersing it in water.

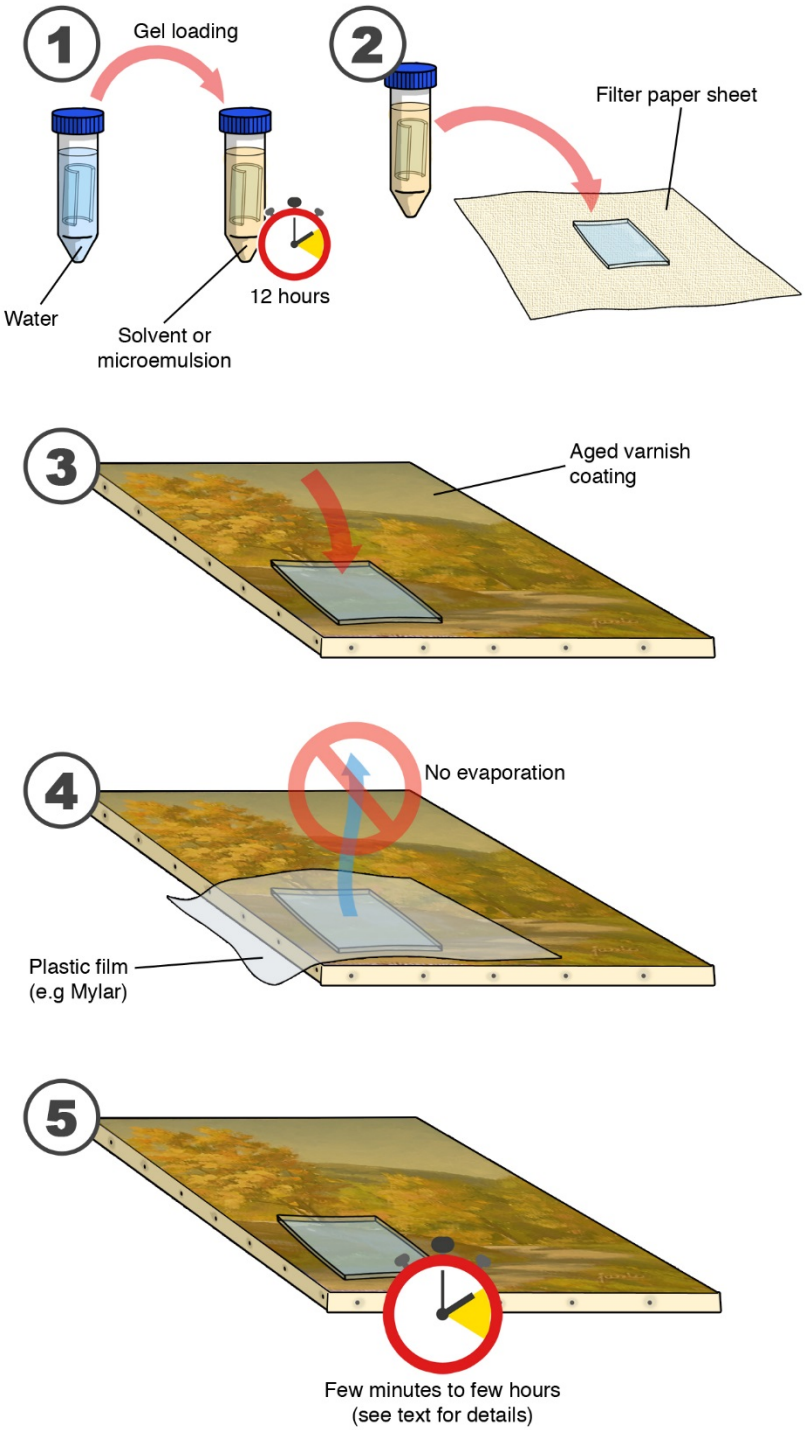

Figure 2a. Application of Nanorestore Gel® Peggy (loaded with solvents or Nanorestore Cleaning® formulations) for the removal of polymeric coatings or aged varnishes.
(1) Loading Nanorestore Gel® Peggy with water/alcohol blends or Nanorestore Cleaning® aqueous formulations can be carried out by immersing the original water-loaded gel into the desired cleaning fluid for at least 12 hours.
(2) Water excess on the gel surface has to be removed by gently placing the gel between two sheets of adsorbing paper. The surface of the gel should appear dry.
(3) Place the gel over the surface.
(4) Use a plastic film to avoid liquid evaporation (Mandatory in this case).
(5) Application time ranges from a minute to 3-4 hours.

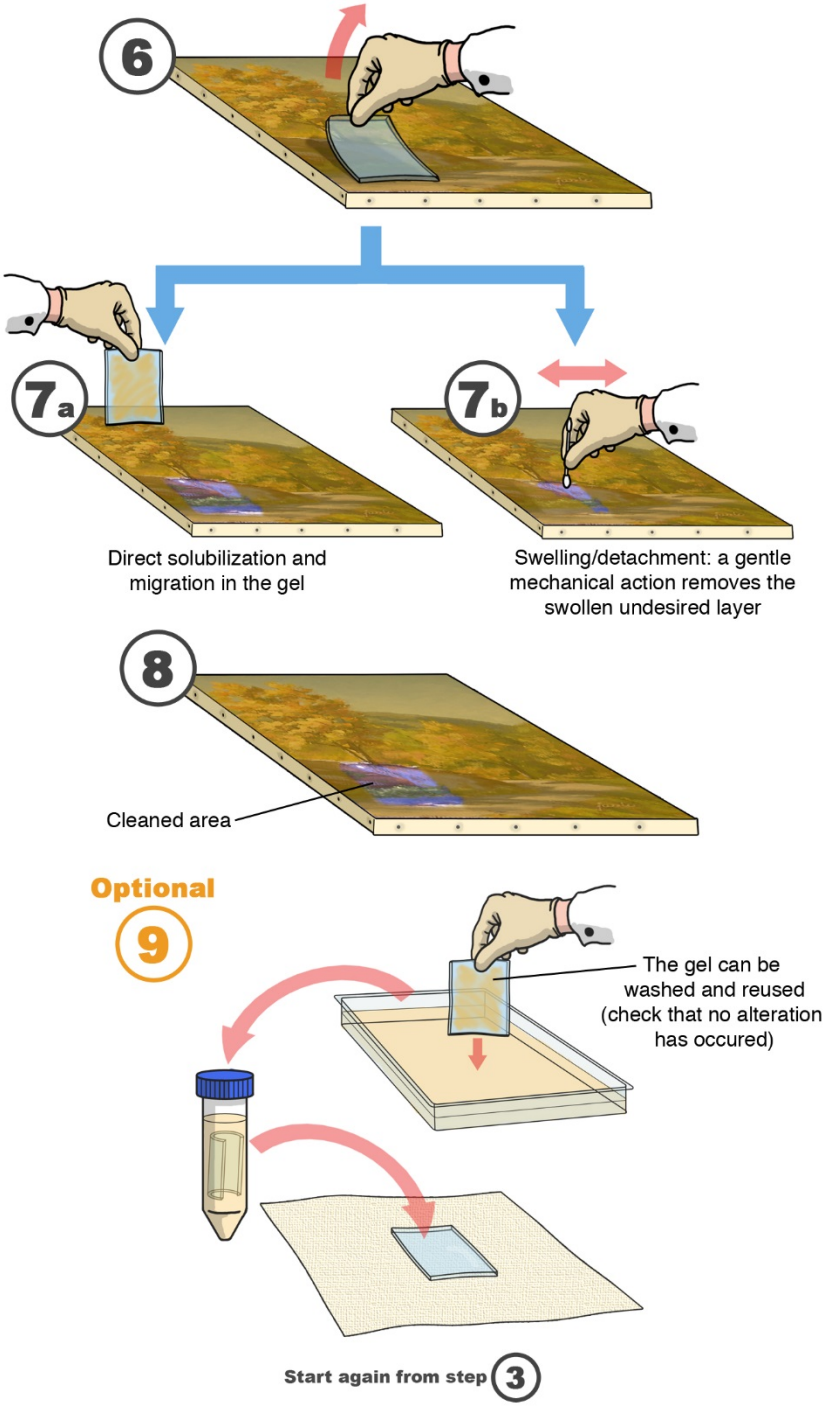

Figure 2b. Application of Nanorestore Gel® Peggy (loaded with solvents or Nanorestore Cleaning® formulations) for the removal of polymeric coatings or varnishes.
(6) Remove the gel.
(7) When the unwanted material is solubilized, a mechanical action is not needed, being the dirt/grime entrapped into the gel network (a). if the application leads to the swelling of grime or dirt, the removal of swollen and soften materials should be carried out by gentle mechanical action (e.g. using a swap) (b).
(8) The treated area is now clean.
(9) The gel can be reused up to 5 times, by re-immersing it into the solvent or Nanorestore Cleaning® formulation.

FREQUENTLY ASKED QUESTIONS

Q I forgot to put back into the container the Nanorestore Gel® Peggy and now it is completely dried. Can I reuse it, if rehydrated?

A No, completely dried gel cannot be reused, even if rehydrated. As a metter of fact, the complete drying of Nanorestore Gel® Peggy could affect the cleaning effectiveness of the system.

REFERENCES

Further information can be found in the following textbooks:

1. Piero Baglioni e David Chelazzi. *Nanoscience for the Conservation of Works of Art*. Royal Society of Chemistry, 2013.

2. Piero Baglioni, David Chelazzi e Rodorico Giorgi. *Nanotechnologies in the Conservation of Cultural Heritage: A Compendium of Materials and Techniques*. Springer, 2014.

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