

TECHNICAL DATA SHEET

2092 012 | Nanorestore Gel®, MWR Dry

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NANORESTORE Gel® MWR DRY

OVERVIEW

Nanorestore Gel® Dry are water-based chemical gels, which leave no residues on the surface of the treated artefacts. 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 nanostructure fluids of the Nanorestore Cleaning® series.

AVAILABLE FORMULATIONS

Nanorestore Gel® Medium Water Retention - MWR

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

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 hydro soluble dirt, grime or dust from canvas paintings
- ... Removal of hydro soluble dirt, grime or dust from paper (pay attention to the presence of hydro soluble inks or pigments)
- ... Removal of hydro soluble dirt, grime or dust from paintings on wood
- ... Removal of hydro soluble 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

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 water based 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 hypochlorite solution for 1-2 minutes, carefully rinsed with water in order to remove the hypochlorite, 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 following 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 vapours 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 (Fig. A2 / B2). Then, before 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 (Fig. A3 / B3). 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 to optimize the adhesion of the gel and remove any air bubbles between the gel and the surface (Fig. A4 / B4).

Reducing evaporation (optional)

If needed, a plastic film can be placed over Nanorestore Gel® Dry to keep the gel wet during the cleaning operation, reducing the evaporation of water (Fig. A4 / B4). It is worth noting that in the case of standard operations, this procedure is not needed, is the application time short if compared to the evaporation time of water confined in the 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 several hours (Fig. 1a. 4 or Fig. 2a. 5). In the case of lengthy application, it is mandatory to protect the gel from water evaporation to avoid the drying of Nanorestore Gel® Dry (Fig. A5 / B5).

Removal

Nanorestore Gel® Dry can be removed from the treated surface by using tweezers or by delicately peeling the gel (Fig. A4 / B4).

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 softened materials should be carried out by a gentle mechanical action (e.g. using a swab) (Fig. A7.2 / B7.2). 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. A7.1 / B7.1).

Repeated applications

Nanorestore Gel® Dry can be used in a single application or 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 in the “Application” section.

Reusing the gel

During cleaning operations, Nanorestore Gel® Dry can be used on both sides. In addition to that, Nanorestore Gel® Dry can be used several times after the first application, provided that they are immersed in water overnight or at least for 12 h, to re-load pure water and release dirt/grime (Fig. A9 / B9). For instance, Nanorestore Gel® 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 Gel® Dry following the first use is not advisable.

Loading of solvents or other liquids

Loading Nanorestore Gels® Dry with solvents (e.g. glycols, alcohols, ethanol amine), 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. B1). 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 | ✗ Propylenes carbonate | ✗ Toluene |
| ✗ Xylenes | | |

Final clearance

After the application of Nanorestore Cleaning®-loaded gels, a final clearance can be carried out using Nanorestore Gel® 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 a 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	Possibly surfactants, only if loaded with Nanorestore Cleaning® formulations
Final clearance	Rinse with water (or apply a water-loaded gel) if surfactant residues can be present, only if Nanorestore Cleaning®-loaded gels have been used

Figure A: Application of Nanorestore Gel® Dry for the removal of hydro soluble dirt.

- A1 Provide the hydrogel placed in water.
- A2 Remove the hydrogel from the container.
- A3 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.
- A4 Place the gel over the surface. Optional: Use a plastic film to avoid evaporation.
- A5 Application time ranges from a minute to 3 - 4 hours.
- A6 Remove the gel.
- A7 When the unwanted material is solubilized, a mechanical action is not needed, being the dirt/grime entrapped into the gel network (Fig. 7.1). 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) (Fig. 7.2).
- A8 The treated area is now clean
- A9 - A11 the gel can be reused up to 5 times, by reimmersing it in water.

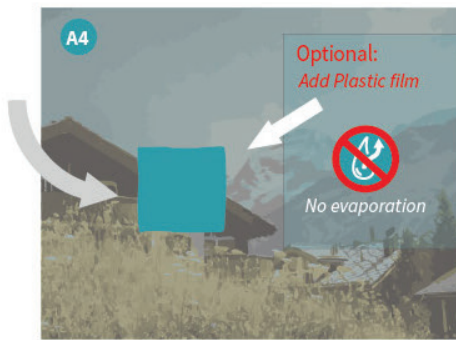
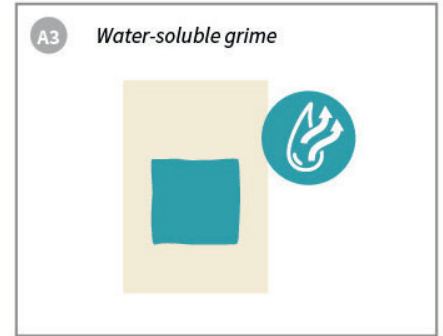
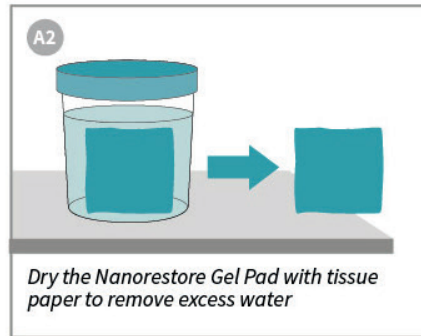
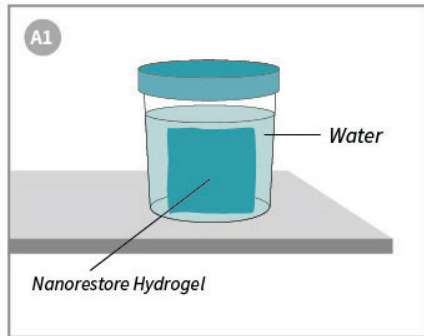
Figure B: Application of Nanorestore Gel® Dry (loaded with solvents or Nanorestore Cleaning® formulations) for the removal of polymeric coatings or aged varnishes.

- B1 Loading Nanorestore Gel® Dry 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.
- B2 Remove the hydrogel from the container.
- B3 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.
- B4 Place the gel over the surface. Optional: Use a plastic film to avoid evaporation.
- B5 Application time ranges from a minute to 3-4 hours.
- B6 Remove the gel.
- B7 When the unwanted material is solubilized, a mechanical action is not needed, being the dirt/grime entrapped into the gel network (B7.1). 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) (B7.2).
- B8 The treated area is now clean.
- B9 - B11 The gel can be reused up to 5 times, by re-immersing it into the solvent or Nanorestore Cleaning® formulation.

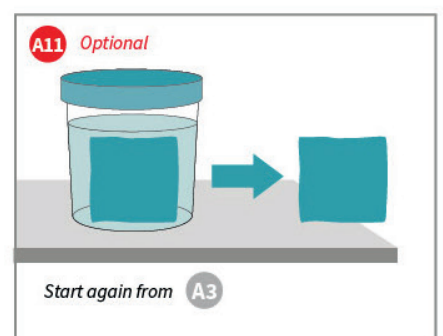
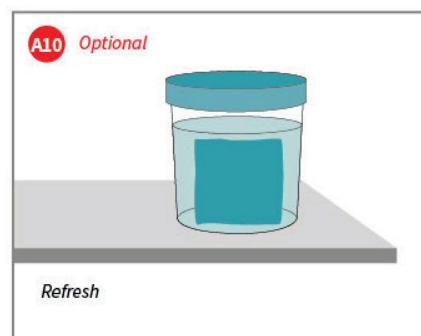
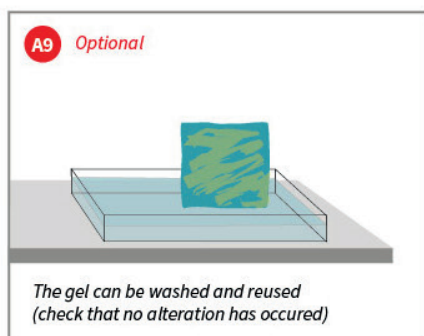
FREQUENTLY ASKED QUESTIONS

- 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.

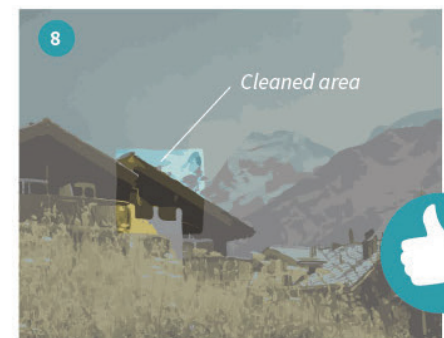
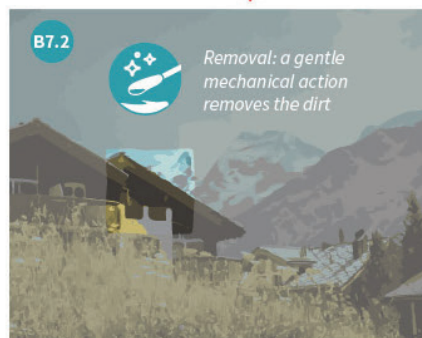
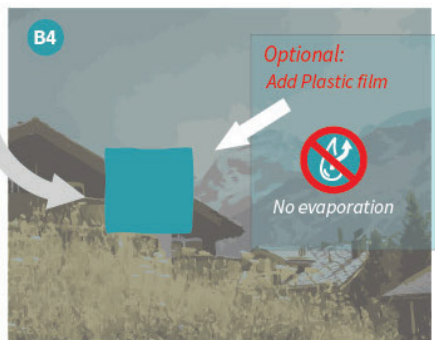
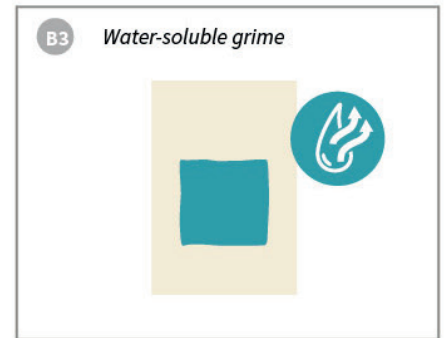
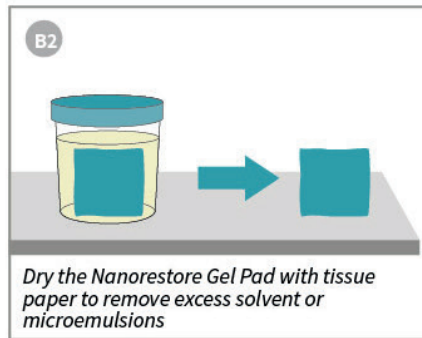
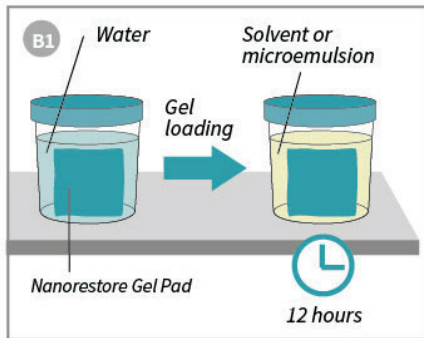
A: Cleaning a surface by using a Hydrogel



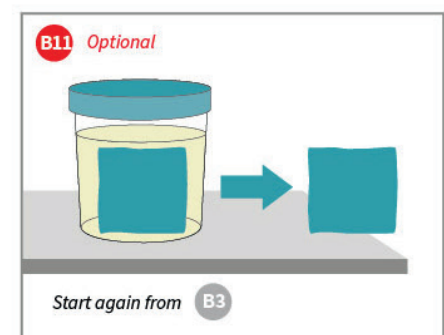
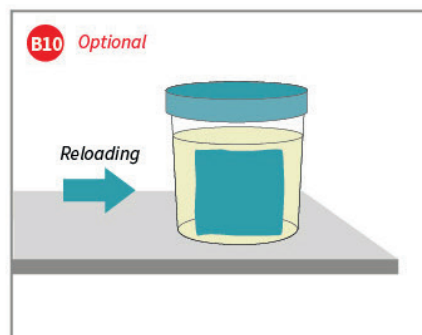
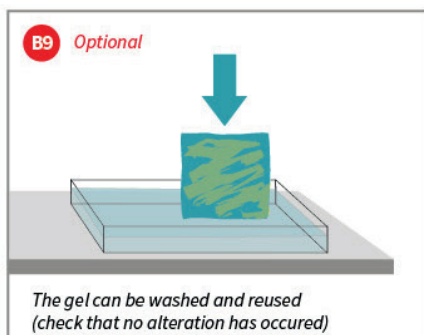
Store the Hydrogel 24 hrs in Aqua Dest. before loaded again with solvent or microemulsion.



B: Cleaning a surface or removing a coating by using a Hydrogel



Store the Hydrogel 24 hrs in Aqua Dest. before loaded again with solvent or microemulsion.



REFERENCES

Further information can be found in the following textbooks: :

1. Piero Baglioni and David Chelazzi. Nanoscience for the Conservation of Works of Art. Royal Society of Chemistry, 2013.
2. Piero Baglioni, David Chelazzi, and Rodorico Giorgi. Nanotechnologies in the Conservation of Cultural Heritage: A Compendium of Materials and Techniques. Springer, 2014.

ICONOLOGIE - EXPLANATION OF THE SYMBOLS



Trocknen / *Drying*



Komprimieren, Zusammenfallen /
Compress, fold together



Schwamm / *Sponge*



Mit Schwamm trocknen /
Dry with sponge



Scalpell oder Cutter benutzen /
Use scalpel or cutter



Mit trockenem Wattestäbchen reinigen /
Clean with dry cotton swab



Zeit beachten / *Watch time*



Sprühen / *Spray*



Aufquellen / *Swelling, soaking*



Messen, Analysieren /
Measuring, analysing



Richtig, fertig / *right, finished*