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NANORESTORE®

Nano-lime dispersion in isopropyl alcohol
Italian patent Consorzio CSGI-Università degli Studi of Florence
n. FI/96/A/000255, 31/10/1996

PROPERTIES

Due to the absolutely innovative nature of the product, the Consorzio CSGI, inventor of the formula, offers technical advice for scientific purpose in order to individuate the best application solutions (for information you may refer to CSGI staff at the following address: direttore@csgi.unifi.it).

Nanorestore® is the most compatible consolidant of all with frescos and stone materials of carbonate matrix, as it is composed of particles of slaked lime, with size in the range of nanostructured materials, dispersed in isopropyl alcohol.

Alcohol guarantees an excellent penetration into porous materials (due to its low superficial tension) by capillary suction; and penetrating in the porous matrix it carries with itself the nanostructured particles, that seep into the interstices and in the porosity to be consolidated, immediately under the surface.

Once transformed into calcium carbonate through the action of atmospheric carbon dioxide, they originate a network of calcite micro-crystals that impart new and high mechanical properties to the artefact without introducing materials extraneous to the chemical nature of the artwork. The consolidating thicknesses are strictly superficial, on the order of some hundreds of microns.

Nanorestore® is perfectly fit for the application as a surface pre-consolidating product before any other cleaning preliminary operation.

PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	opalescent white liquid
Viscosity at 25°C:	2.75 cP
Solids content:	0.5%
Specific gravity:	approx. 0.8 g/cm ³

APPLICATION METHOD

Before using shake the container energetically for at least 2 minutes. The dispersion, for use on frescos, can be diluted in the case that, after applicative tests, you note effects of white glazing, that can be easily removed with simple water poultices.

In case of carbonate matrix stone materials the dilution could not be necessary. The dilution ratio has to be chosen with reference to the absorbing capacity of the surface to be treated and of the porosity of the artefact.

Following dilutions are suggested:

from 80 to 500 cc up to 1 l

The dilution ratio has to be chosen from time to time in relation to work of art the absorbing capacity of the porous matrix. Obviously the more the dispersion is diluted, the more numerous could be the necessary applications. The solvent to add for dilution is CTS Denatured Isopropyl Alcohol, pure or – for particular application - mixed with demineralised water, up to a water content not higher than 50% in volume. The use of more or less considerable quantities of water depends on the humidity conditions of the wall and of the environment: the poorer they are, the larger quantity of water is needed and vice versa. After having diluted the product, shake again the container with the diluted dispersion and apply by brush or spraying, protecting the wall with Japanese paper.

Apply until wall saturation (until "rejection") and wait the complete drying before doing a following application. Considerable consolidation effects can be reached after a number of applications directly linked to the selected concentration: the more the dispersion is diluted, the higher will be the number of applications needed. The normal range is 1 to 2 applications for the most concentrated up to 10-12 for the most diluted one. After the last application wait 5-7 days before making cleaning tests and verifying the mechanical properties of the surface.

Before all applications the container with the dispersion has to be shaken and the same care has to be used in keeping shook the containers during the applications.

The surface treatable with 1 litre of product cannot be defined in advance because it depends on the use concentration and on the absorption capacity of the wall matrix. All that said, we can estimate that the product to a standard concentration allows to treat approx. 5-10 m² of middle porosity pictorial surface with a middle degree of superficial decohesion.



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It is not suitable to use Nanorestore® in those situations where the porousness surface is cancelled by the presence of polymeric fixatives, substantial deposits of dirt or strong lime paints.

The use of the product not as a simple pre-consolidant, but as a final consolidant in the presence of sulphation needs a desulphurization pretreatment with poultices of ammonium carbonate solutions or Amberlite 4400 OH anion exchange resin. At this point Nanorestore® can be used as usual even as an alternative to poultices of barium hydroxide solution, even though in this case it is suggested to contact Consorzio CSGI.

Possible problems are reported in the presence of very high quantities of magnesium salts. In any case, before using the product, it is strongly recommended to make a minimal diagnostic test campaign with the purpose of determining the pictorial technique and evaluating the deterioration.

Finally, it is emphasized that the product is preferably suitable for the "fresco" painted parts.

SAFETY PRECAUTIONS

Nanorestore® does not present particular hazards for users.

During spraying applications, wear a mask providing protection against isopropyl alcohol vapours and in rooms with poor aeration, facilitate the vapours dispersion by using filtering extractors.

Nanorestore® is a flammable product. For this reason it needs to be handled and stored according to the usual precautions for this kind of products.

STABILITY AND STORAGE

Sediment can form on the bottom, it is suggested to shake the container energetically before using. The containers tightly closed and without air or humidity have a shelf-life of 12 months.

PACK SIZE

Nanorestore® is available in 1 litre containers.

The information contained in this sheet is based on our knowledge and laboratory tests at the date of the last version. Users must verify the suitability of the product for the specific use by preliminary tests, and is required to comply with the laws and regulations in force concerning safety and hygiene.

C.T.S. S.r.l. guarantees the constant quality of the product but is not liable for any damage caused by improper use of the material. Product intended for **professional use** only.



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In the following list are some **references** relevant to the use of **Nanorestore®**:

Name of the monument/work/site	Town - Country	Year
Mural paintings of the Cappellone degli Spagnoli in the Church of Santa Maria Novella	Florence - Italy	1997
Mural paintings of the Cathedral of Santa Maria del Fiore	Florence - Italy	1999
Filippo Lippi's mural paintings in the Cathedral of Prato	Prato - Italy	2002-3
Medieval mural paintings (XIII and XIV century) in the Crypt of San Zeno	Verona - Italy	2005
Mural paintings in Santa Maria delle Grazie	Gravedona-Como - Italy	2005
Mural paintings in the Maya site of Calakmul (World Heritage Site declared by UNESCO)	Calakmul – Mexico	2005-2008
Frescos in the “Cappella del Podestà” in Bargello Museum	Florence – Italy	2006
“La leggenda della Vera Croce” by Agnolo Gaddi, Church of Santa Croce	Florence – Italy	2007
Mural paintings in “Villa del Bene”	Volargne-Verona - Italy	2007
Angera stone bas-relieves in Ca' Granda – “Università Statale” of Milan	Milan – Italy	2007
Paintings in the Church of Vendel	Vendel – Sweden	2007-2008
Mural paintings in the Aztec site of Tlatelolco	Mexico Ciy – Mexico	2007-2008
Mural paintings in the “Annunciazione” Chapel	Nazareth – Israel	2008
Mural paintings in the Aztec site of Cholula	Cholula - Mexico	2008