



# D1.2 – Report and database on commercial consolidants and protective coatings

## Project Information

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## Deliverable Information

<b>Deliverable n°</b>	1.2
<b>Deliverable title</b>	Report and database on commercial consolidants and protective coatings
<b>WP no.</b>	1
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<b>Contributing Partners</b>	INSTM, OPAAE, COLOR, CS, IATCS, ARCHI, DNO, ISCR
<b>Nature</b>	Elaboration Database File (.pdf); database (.xls)
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<b>Reviewers</b>	Marco Lezzerini, Valter Castelvetro
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## Dissemination Level

PU	Public	✓
PP	Restricted to other programme participants (incl. Commission Services)	
RE	Restricted to a group specified by the consortium (incl. Commission Services)	
CO	Confidential, only for the members of the consortium (incl. Commission Services)	✓



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## Document Log

Version	Date	Author	Description of Change



Horizon 2020



## Table of Contents

1	Aim .....	4
2	Structure of the database .....	4
3	Evaluation of the data collected with the survey.....	5
4	Database on commercial products .....	14
5	Database on research products .....	82
	Annex 1: technical forms for commercial and research products	
	Annex 2: technical forms collected from the Partners on commercial products	
	Annex 3: technical forms collected from the Partners on research products	



## 1 Aim of the research

The aim of this research is to provide a database of the most applied commercial products and the most relevant research products from the current scientific literature in Europe for the consolidation and the protection of natural decayed stones. Two technical forms (Annex 1) were set-up and sent to the Partners for the survey: the first one related to available commercial products<sup>1</sup> and the second one to the research products<sup>2</sup>.

The collected data (Annex 2 and 3) are, therefore, coming from the Project Partners on the basis of their experience and the elaborated data are strictly connected to this provenance; they do not include all the commercial or research products available.

## 2 Structure of the database

The structure of the database is reported in Fig. 1 and it is divided in two main categories: commercial products and research products. Both categories collect the forms of consolidants and protective/antifouling coatings, which in turn have been collected according to their chemical class.

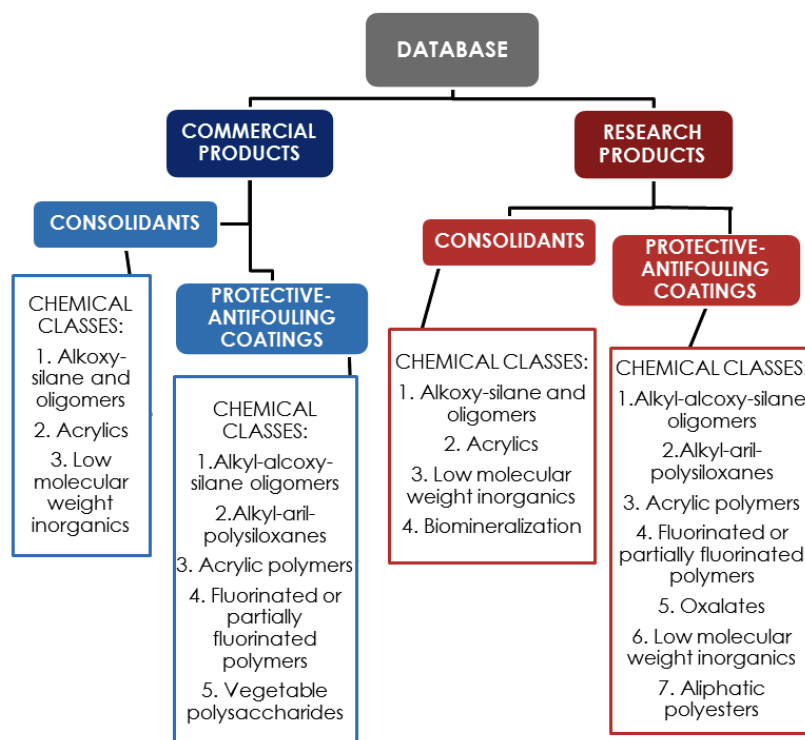


Fig.1: structure of the database.

<sup>1</sup> Commercial product: material currently available on the market equipped with a trademark and trade name and a Technical datasheet.

<sup>2</sup> Research product: material, nano-material, chemical compound, inorganic molecule, oligomer, polymer not available on the market, prepared in the lab or supplied for research aims.



### 3 Evaluation of the data collected with the survey

#### 3.1 Commercial products

Among commercial products, the total number of different consolidant materials is 37. They can be divided in three main chemical classes: alkoxy-silane and oligomers, acrylics and low molecular weight inorganics (Fig. 2). Among them, 12 contain nanoparticles in the formulation, in particular  $\text{Ca}(\text{OH})_2$ ,  $\text{SiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Al}_2\text{O}_3$  nanoparticles (Fig. 3). Regarding the dispersing media, the most used ones are the organic solvents (Fig. 4).

Among commercial products, the total number of different protective coatings is 21, 2 of which have antifouling properties. They can be divided in 5 chemical classes: alkyl-alkoxy-silane oligomers, alkyl-aril-polysiloxanes, fluorinated or partially fluorinated polymers, low molecular weight inorganics and vegetable polysaccharides (Fig. 5). Among them 5 contain nanoparticles in the formulation, in particular Ag,  $\text{SiO}_2$ ,  $\text{TiO}_2$ , ZnO nanoparticles (Fig. 6). Organic solvents are the most used in the formulations (Fig. 7).

Commercial consolidant: Chemical class

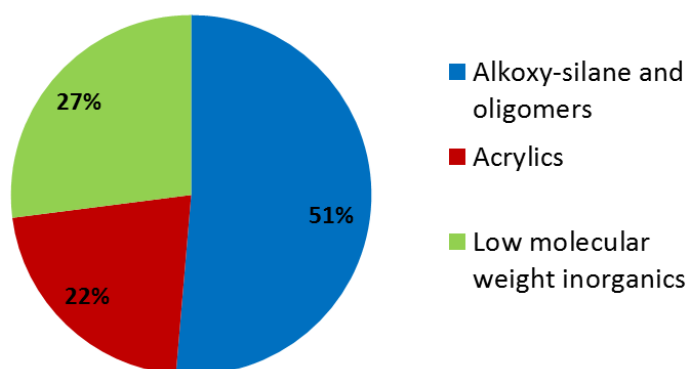


Fig. 2: chemical classes of commercial consolidants.

Commercial consolidant: Nanoparticles

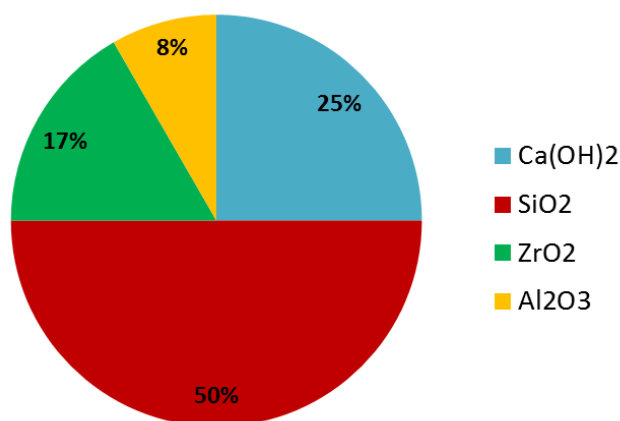


Fig. 3: nanoparticles present in commercial consolidants.



Horizon 2020



### Commercial consolidants: Solvent

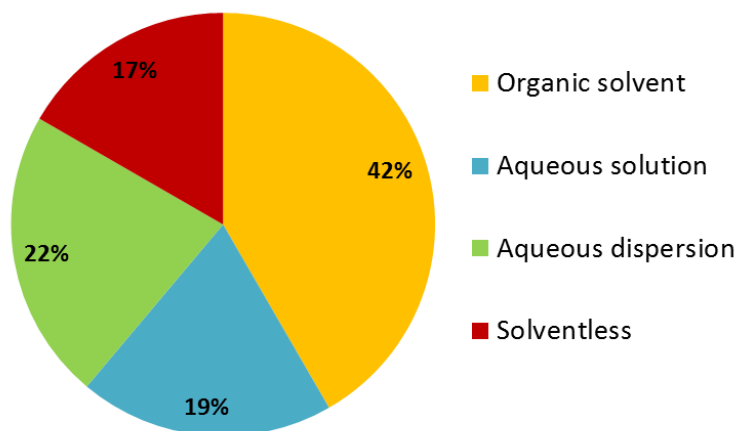


Fig. 4: solvents used in commercial consolidants.

### Commercial protective coatings: Chemical class

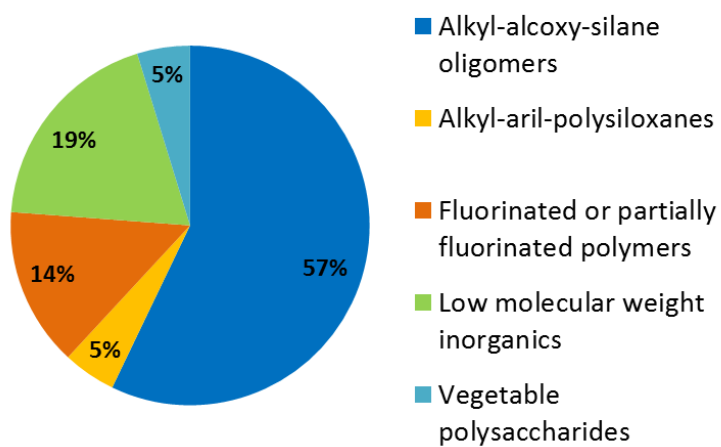


Fig. 5: chemical classes of commercial protective coatings.



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### Commercial protective coatings: Nanoparticles

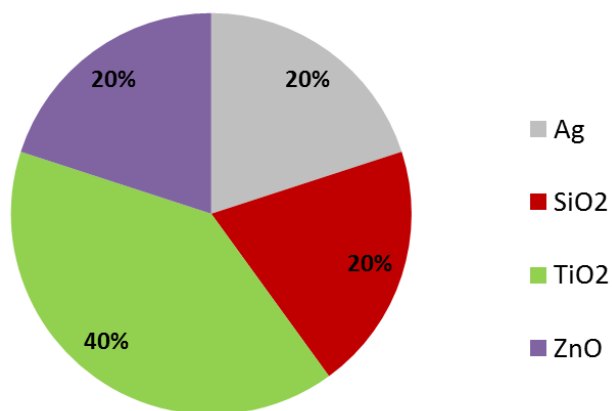


Fig. 6: nanoparticles present in commercial protective coatings.

### Commercial protective coatings: Solvent

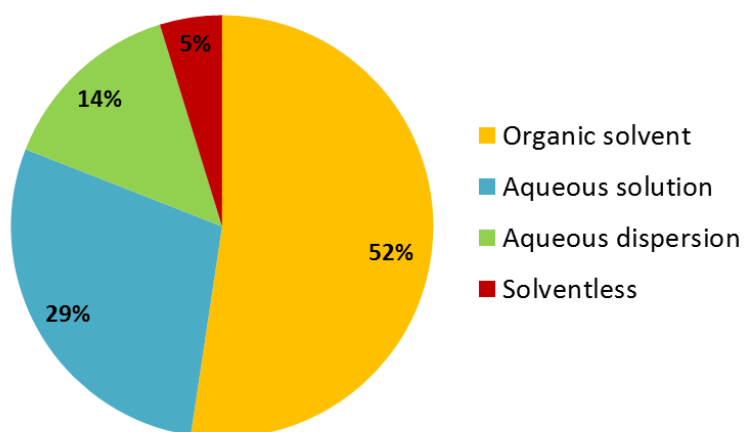


Fig. 7: solvents used in commercial protective coatings.



### 3.2 Research products

Among research products the total number of consolidants is 39, 2 of which have also antifouling properties. They can be divided in 4 main chemical classes: alkoxy-silane and oligomers, acrylics, low molecular weight inorganics and products of biomineralization (Fig. 8). A wide range of nanoparticles have been used in the formulation and in particular nano-SiO<sub>2</sub> is the most used one (Fig. 9). Organic solvents are the most used in the formulations (Fig. 10), which have been applied on different stone substrates (Fig. 11), following different application methods (Fig. 12).

The total number of protective coatings is 27, 4 of which have antifouling properties and 2 of which have both properties. They can be divided in 4 main chemical classes: alkyl-alkoxy-silane oligomers, alkyl-aril-polysiloxanes, acrylic polymers, fluorinated or partially fluorinated polymers, oxalates, low molecular weight inorganics and aliphatic polyester (Fig. 13). Also for research protective coatings, a wide range of nanoparticles have been used in the formulation among which nano-TiO<sub>2</sub> is the most used one (Fig. 14). Organic solvents are the most used in the formulations (Fig. 15), which have been applied on different stone substrates (Fig. 16), following different application methods (Fig. 17).

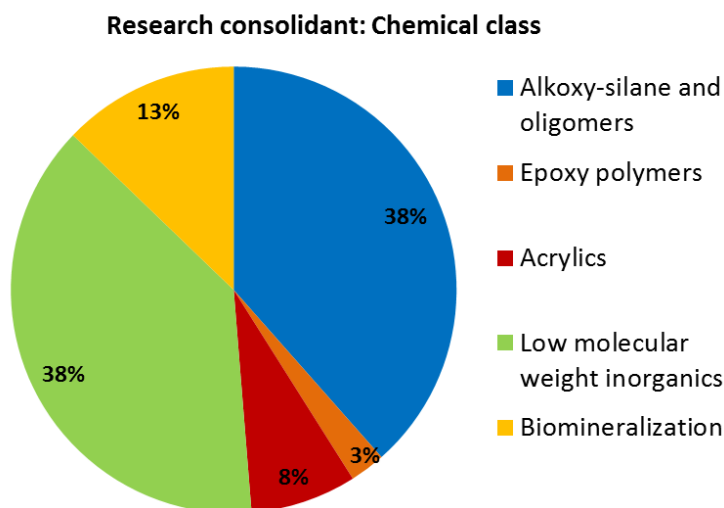


Fig. 8: chemical classes of research consolidants.





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# Nano-Cathedral

## Research consolidant: Nanoparticles

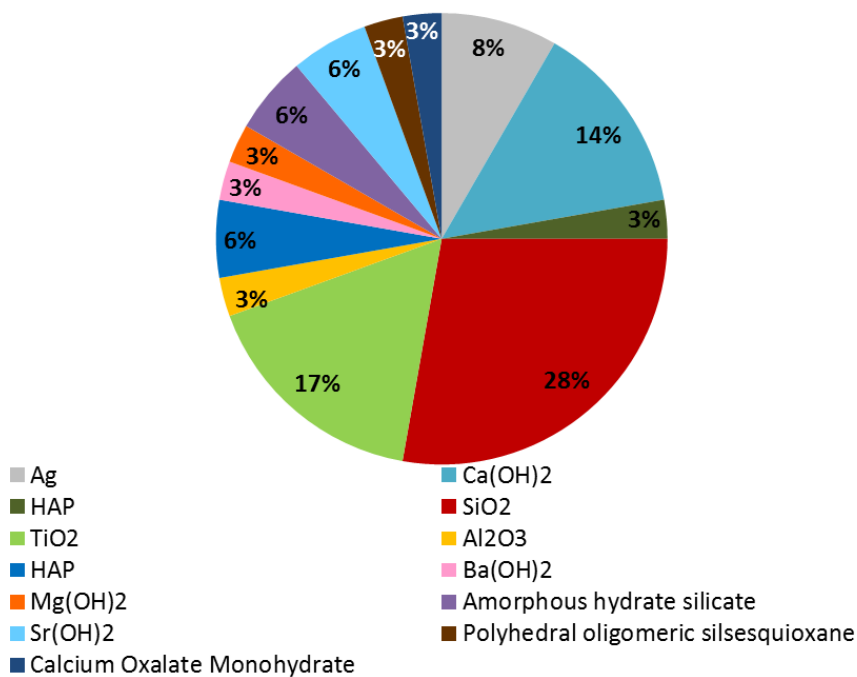


Fig. 9: nanoparticles used in research consolidants.

## Research consolidants: Solvent

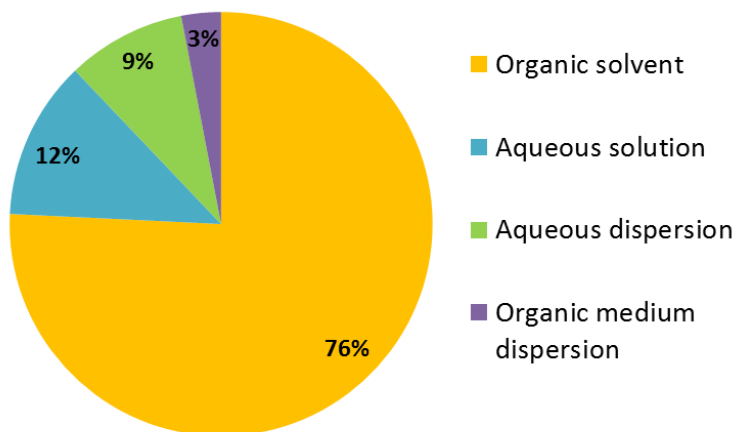


Fig. 10: solvents used in research consolidants.



Horizon 2020



Research consolidants: Stone substrate

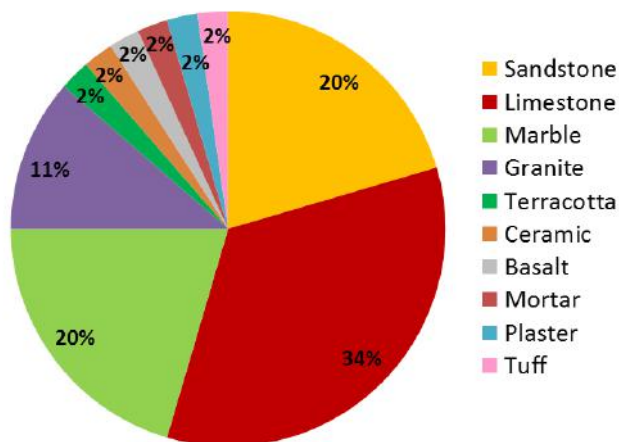


Fig. 11: stone substrates on which research consolidants were applied.

Research consolidants: Application method

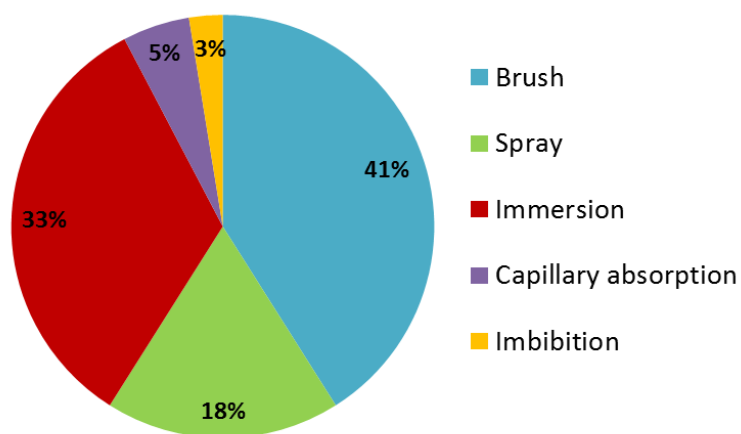


Fig. 12: application methods of research consolidants.



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### Research protective coatings: Chemical class

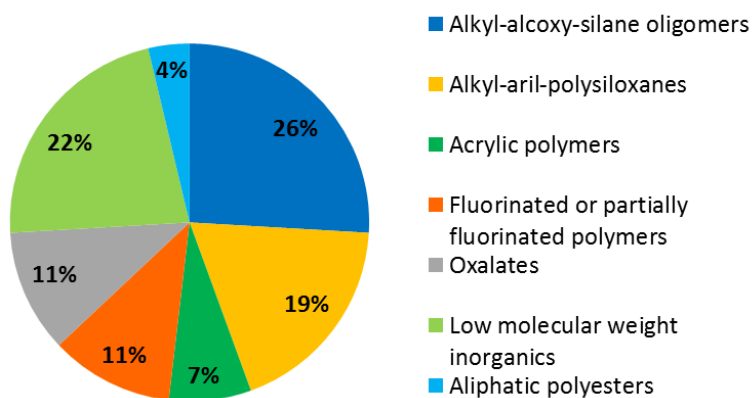


Fig. 13: chemical class of research protective coatings.

### Research protective coatings: Nanoparticles

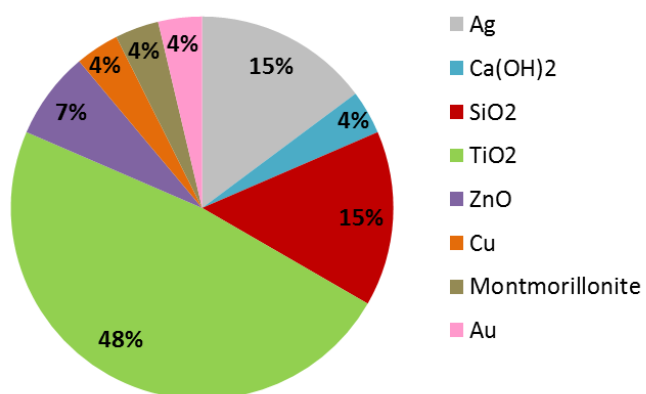


Fig. 14: nanoparticles used in research protective coatings.



Horizon 2020



Research protective coatings: Solvent

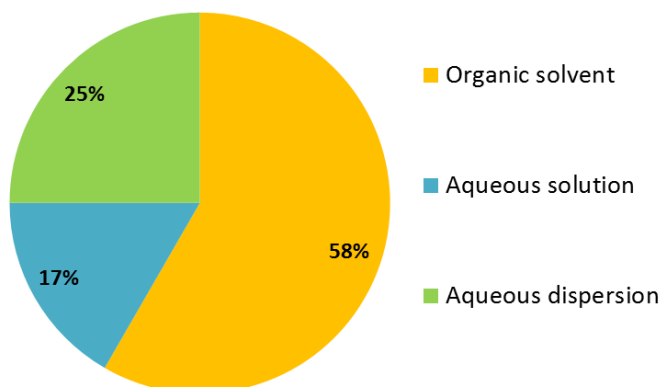


Fig. 15: solvents used in research protective coatings.

Research protective coatings: Stone substrate

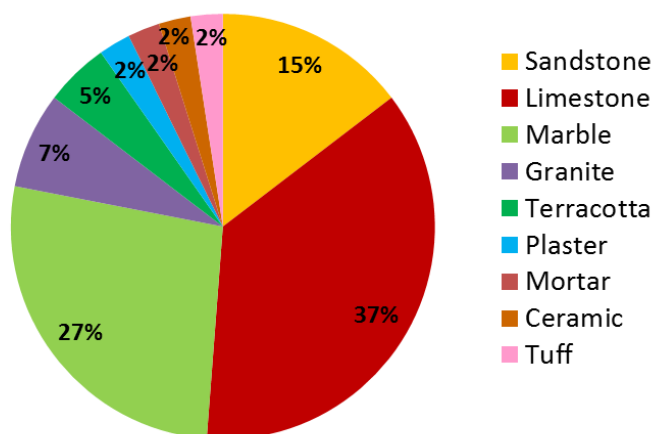


Fig. 16: stone substrates on which research protective coatings were applied.



Horizon 2020



Research protective coatings:  
Application method

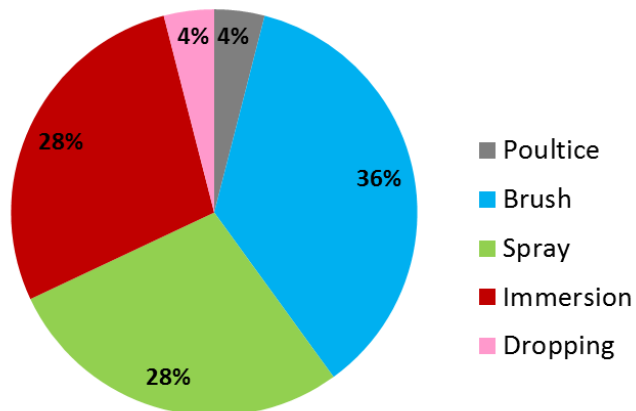


Fig. 17: application methods of research protective coatings.



## 4 Database on commercial products

### 4.1 Consolidants

#### 4.1.1 Alkoxy-silane and oligomers

1.

COMPILER	
Partner name	OPAE
Country	ITALY

PRODUCT	
Trade name	CONSOLIDANT BS OH 100
Company	WACKER
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Ethyl Silicate
Concentration	Density 1g/cm <sup>3</sup>

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	Solventless



Horizon 2020



Additives	
Additives	NO
Others (specify)	

2.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	CONSOLIDANTE DN
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Ethyl Silicate
Concentration	70%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Isopropanol
Others (specify)	



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Additives	
Additives	Catalyst
Others (specify)	Metal organic compound

3.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	ESTEL 1000
Company	CTS
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Tetraethyl Orthosilicate
Concentration	75%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	White Spirit D40
Others (specify)	





Horizon 2020



Additives	
Additives	NO
Others (specify)	

4.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	ESTEL 1100
Company	CTS
Country	Italy
Main property of the product	Consolidant
Others (specify)	Water repellent

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Tetraethyl Orthosilicate & Oligomeric Polysiloxane
Concentration	75%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	White Spirit D40



Horizon 2020



<b>Others (specify)</b>	
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Additives	
<b>Additives</b>	NO
<b>Others (specify)</b>	

5.

COMPILER	
<b>Partner name</b>	IATCS
<b>Country</b>	AUSTRIA

PRODUCT	
<b>Trade name</b>	KSE H
<b>Company</b>	REMMERS BAUSTOFFTECHNIK GMBH
<b>Country</b>	Germany
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	Hydrophobic effect

Information about the product	
<b>Information obtained from:</b>	Technical and safety data sheet
<b>Others (specify)</b>	
<b>Technical/Scientific published reference</b>	

Active ingredient from technical data sheet	
<b>Active ingredient</b>	Silicic acid Ethyl Ester
<b>Concentration</b>	approx. 99 % per mass

Nanoparticles	
<b>Nanoparticles</b>	NO
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	NO
Specify solvent	
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	Neutral/hydrophobic additives

NOTES
Gel deposit rate: approx. 30 % (approx. 300 g/l). Suitable for the consolidation of medium pored, absorbent and friable mineral building materials, preferably sandstone, with hydrophobic effect at once. It can also be used to strengthen historical renders and joints. In the case of stone that has pronounced swelling and shrinking properties because of swelling capable clay minerals, a pre-treatment with Remmers Antihydro (Art. No. 0616) to reduce swelling is recommended.

6.

COMPILER	
Partner name	IATCS
Country	Austria

PRODUCT	
Trade name	KSE 100
Company	Remmers Baustofftechnik Ges. mbH
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Silicic acid ethyl ester
Concentration	approx. 20 % per mass



Horizon 2020



Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	Catalyst system: neutral

NOTES
"Soft strengthener" - suitable for strengthening fine-pored and low strength mineral materials. Low gel deposit rate approx. 10 % (100g/l). It can also be used to strengthen historical renders and joints. In the case of stone that has pronounced swelling and shrinking properties because of swelling capable clay minerals, a pre-treatment with Remmers Antihydro (Art. No. 0616) to reduce swelling is recommended. Within the "Remmer-Baukastensystem" it is used as first step of consolidation. Former sold under name "Funcosil KSE ..."

7.

COMPILER	
Partner name	ARCHI
Country	BELGIUM

PRODUCT	
Trade name	KSE 300
Company	REMMERS BAUSTOFFTECHNIK GMBH
Country	Germany
Main property of the product	Consolidant
Others (specify)	



Horizon 2020



Information about the product	
Information obtained from:	Technical and safety data sheets
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Silicic acid Ethyl Ester
Concentration	99%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	Solventless

Additives	
Additives	NO
Others (specify)	

NOTES
More information on: <a href="http://www.remmers.co.uk/Product-catalogue.159+M5ca61f3bdc1.0.html#bot">http://www.remmers.co.uk/Product-catalogue.159+M5ca61f3bdc1.0.html#bot</a>

8.

COMPILER	
Partner name	IATCS
Country	Austria



Horizon 2020



PRODUCT	
Trade name	KSE 510
Company	Remmers Baustofftechnik Ges. mbH
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheets
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	(Partly prehydrolyzed) silicic acid ethyl ester
Concentration	approx. 99 % per mass

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	Solventless

Additives	
Additives	
Others (specify)	Catalyst system: neutral



## NOTES

Can be used to strengthen absorbent, large pored, strong weathered mineral materials, especially sandstones. It can also be used to strengthen historical renders and joints. In Austria it is used as well for the consolidation of very high weathered limestones. Gel deposit rate: > 40 % (approx. 420 g/l). Widely used in Austria.

In this group are also available:

**KSE 500 E** = Plasticized stone strengthener on a silicic acid ethyl ester (KSE) base. Gel deposit rate: approx. 50 %. Can be used to strengthen morbid and large pored sandstones, particular vulcanites e.g. tuff.

**KSE 500 STE** = Plasticized stone strengthener on a silicic acid ethyl ester (KSE) base with high gel deposit rate (approx. 500 g/l). Contains pure mineral aerosols. It is used in the "KSE-modul-system" as binder for injection mortars (force-locked connection of scales). In the case of stone that has pronounced swelling and shrinking properties because of swelling capable clay minerals, a pre-treatment with Remmers Antihydro (Art. No. 0616) to reduce swelling is recommended for all products.

Former sold under name "Funcosil KSE ...".

9.

## COMPILER

Partner name	COLOR
Country	Italy

## PRODUCT

Trade name	KVP000004
Company	Colorobbia Consulting s.r.l.
Country	Italy
Main property of the product	Consolidant
Others (specify)	

## Information about the product

Information obtained from:	Technical and safety data sheets
Others (specify)	
Technical/Scientific published reference	

## Active ingredient from technical data sheet

Active ingredient	Polymer and Nanoparticles
Concentration	7,5% w/w



Horizon 2020



Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
pH suspension > 12,0

10.

COMPILER	
Partner name	COLOR
Country	Italy

PRODUCT	
Trade name	KVP000005-KVP000006
Company	Colorobbia Consulting s.r.l.
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheets
Others (specify)	
Technical/Scientific published reference	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage





Horizon 2020



Active ingredient from technical data sheet	
Active ingredient	Polymer and nanoparticles
Concentration	9% w/w (KVP00005)

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
Bi component product pH KVP000005 > 12,0 pH KVP000006 = 6

11.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	PROTECTOSIL SH 100
Company	EVONIK RESEARCH EFFICIENCY GMBH

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Country</b>	GERMANY
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

Information about the product	
<b>Information obtained from:</b>	Technical and safety data sheet
<b>Others (specify)</b>	
<b>Technical/Scientific published reference</b>	

Active ingredient from technical data sheet	
<b>Active ingredient</b>	Ethyl Silicate
<b>Concentration</b>	100%

Nanoparticles	
<b>Nanoparticles</b>	NO
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	
<b>Specify solvent</b>	
<b>Others (specify)</b>	Solventless

Additives	
<b>Additives</b>	Catalyst
<b>Others (specify)</b>	

12.

COMPILER	
<b>Partner name</b>	ARCHI-GENT
<b>Country</b>	BELGIUM



Horizon 2020



PRODUCT	
Trade name	RC STONE HARDNER
Company	REYNCHÉMIE NV
Country	Belgium
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Ethyl Orthosilicate
Concentration	75%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
This product was used during the restoration works on the St-Bavo's Cathedral in Ghent. For further information on other products by the same manufacturer see: <a href="http://www.reynchemie.com/RC/productcategorie.asp?id=2&amp;taal=3&amp;menuid=2&amp;2.%20Hydrofobic%20pr oducts%20and%20Stone%20hardeners">http://www.reynchemie.com/RC/productcategorie.asp?id=2&amp;taal=3&amp;menuid=2&amp;2.%20Hydrofobic%20pr oducts%20and%20Stone%20hardeners</a>



Horizon 2020



13.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	RC 70 (former Bluesil Res RC 70)
Company	CHEM SPEC SRL
Country	ITALY
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Ethyl silicate
Concentration	70%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	



Horizon 2020



14.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	RC 80 (former Bluesil RES RC 80)
Company	CHEM SPEC SRL
Country	ITALY
Main property of the product	Consolidant
Others (specify)	Protective/water repellent
	Antifouling, Antibacteria

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Metyl Siloxane resins & Tetraethyl Orthosilicate
Concentration	70%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Hydrocarbons
Others (specify)	



Horizon 2020



Additives	
Additives	Catalyst
Others (specify)	Stanno Siloxane

15.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	RC 90 (former Bluesil RES RC 90)
Company	CHEM SPEC SRL
Country	ITALY
Main property of the product	Consolidant
Others (specify)	Protective /water repellent

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Methyl Phenyl Silicone resins & Tetraethyl Orthosilicate
Concentration	70%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	hydrocarbon
Others (specify)	



Horizon 2020



Additives	
Additives	Catalyst
Others (specify)	

16.

COMPILER	
Partner name	ISCR
Country	Italy

PRODUCT	
Trade name	Silicato di etile
Company	Phase
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Producer
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Ethyl silicate
Concentration	70%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	

NOTES

17.

COMPILER	
Partner name	ISCR
Country	Italy

PRODUCT	
Trade name	Tegovakon V
Company	Degussa
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Ethyl silicate
Concentration	98,50%





Horizon 2020



Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	Solventless

Additives	
Additives	Catalyst
Others (specify)	Stannane, dioctylbis[(1-oxododecyl)oxy]

NOTES

18.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	VP 5035
Company	CHEM SPEC SRL
Country	ITALY
Main property of the product	Consolidant
Others (specify)	Protective /water repellent

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Active ingredient from technical data sheet	
Active ingredient	Alkyl Silane
Concentration	75%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Isopropanol
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	

NOTES
Elastic and hydrophobic stone hardner

19.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	WACKER TES 28
Company	WACKER SILICONES
Country	USA
Main property of the product	Consolidant

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Others (specify) \_\_\_\_\_

#### Information about the product

Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

#### Active ingredient from technical data sheet

Active ingredient	Tetraethyl orthosilicate
Concentration	

#### Nanoparticles

Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

#### Solvent/dispersing medium

Solvent/dispersing medium	Organic medium dispersion
Specify solvent	Ethanol
Others (specify)	

#### Additives

Additives	NO
Others (specify)	

## 4.1.2 Acrylics

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage

Grant Agreement no: 646178

35/173



Horizon 2020



1.

COMPILER	
Partner name	ISCR
Country	Italy

PRODUCT	
Trade name	Acril me
Company	Cts
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Acrylic polymer
Concentration	41%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

### NOTES

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



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2.

COMPILER	
Partner name	OPAE
Country	ITALY

PRODUCT	
Trade name	ACRYLIC E-411
Company	ROHM & HAAS ITALY
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Acrylic resin
Concentration	

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	Water
Others (specify)	



Horizon 2020



Additives	
Additives	NO
Others (specify)	

NOTES
In use in PISA OPAE

3.

COMPILER	
Partner name	ISCR
Country	Italy

PRODUCT	
Trade name	Consacril A (f34)
Company	Cir chimica
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Acrylic polymer
Concentration	

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

NOTES

4.

COMPILER	
Partner name	ISCR
Country	Italy

PRODUCT	
Trade name	Kremer k52
Company	Kremer pigmente
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	



Horizon 2020



**Active ingredient from technical data sheet**

<b>Active ingredient</b>	Acrylic polymer
<b>Concentration</b>	28-30%

**Nanoparticles**

<b>Nanoparticles</b>	NO
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

**Solvent/dispersing medium**

<b>Solvent/dispersing medium</b>	Aqueous solution
<b>Specify solvent</b>	
<b>Others (specify)</b>	

**Additives**

<b>Additives</b>	Surfactant
<b>Others (specify)</b>	

**NOTES**

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5.

**COMPILER**

<b>Partner name</b>	CHEM SPEC
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	MICROACRIL CV 40
<b>Company</b>	CHEM SPEC SRL
<b>Country</b>	ITALY
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage





Horizon 2020



Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Acrylic resin
Concentration	40%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

NOTES
Dispersion in water 40 µm of acrylic resins.

6.

COMPILER	
Partner name	IATCS
Country	AUSTRIA



Horizon 2020



PRODUCT	
Trade name	PARALOID B72
Company	ROHM & HAAS
Country	USA
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Solid grade thermoplastic acrylic resin
Concentration	controlled by user (e.g. 5-7 %)

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	High tolerance for ethanol

Additives	
Additives	NO
Others (specify)	

NOTES
In Austria mainly used for consolidation of marble and compact limestones.



Horizon 2020



7.

COMPILER	
Partner name	IATCS
Country	AUSTRIA

PRODUCT	
Trade name	PRIMAL AC33 = RHOPLEX AC-33 = PRIMAL SF-016
Company	ROHM & HAAS
Country	Germany: Kremer Pigmente GmbH & Co. KG
Main property of the product	Consolidant
Others (specify)	Binder additive for mortars

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	<a href="http://polykon.fh-potsdam.de/polymer.php?id=469#lit_670">http://polykon.fh-potsdam.de/polymer.php?id=469#lit_670</a>

Active ingredient from technical data sheet	
Active ingredient	Acrylic polymer
Concentration	Solid content 46-47 %

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	Ammonia max. 0,2 %



Horizon 2020



Additives	
Additives	NO
Others (specify)	

NOTES
Used only exceptionally for consolidation of stone (mainly surface fixing) and plasters; higher application range as additive to mineral binders of mortars and coatings.

8.

COMPILER	
Partner name	OPAE
Country	ITALY

PRODUCT	
Trade name	PRIMAL WS-24
Company	RHOM & HAAS ITALY
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Acrylic polymer
Concentration	Solid content 36%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water 99,4%
Others (specify)	Ammonia 0,6%

Additives	
Additives	NO
Others (specify)	

NOTES
Currently in use in PISA OPAE

### 4.1.3 Low molecular weight inorganics

1.

COMPILER	
Partner name	IATCS
Country	AUSTRIA

PRODUCT	
Trade name	CALOSIL-E5, CALOSIL-E25, CALOSIL-E50
Company	IBZ-SALZCHEMIE GMBH
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	EU-Project, 7th framework "STONECORE" (Grant agreement No 213651)
Technical/Scientific published reference	



Active ingredient from technical data sheet	
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<b>Active ingredient</b>	Nanoparticles
<b>Concentration</b>	

Nanoparticles	
---------------	--

<b>Nanoparticles</b>	Ca(OH) <sub>2</sub>
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	5 g/l, 25 g/l, 50 g/l

Solvent/dispersing medium	
---------------------------	--

<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	Ethanol
<b>Others (specify)</b>	

Additives	
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<b>Additives</b>	
<b>Others (specify)</b>	

NOTES	
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**CaLoSiL-E5:** Low concentrated product, recommended for the strengthening of fresco, powdering surfaces and pre-treatment of dense stones; contains 5 g/L Ca(OH)<sub>2</sub>, Particle size: 50-250 nm.

**CaLoSiL-E25:** Strengthening of porous stones, mortars and plaster; contains 25 g/L Ca(OH)<sub>2</sub>, Particle size: 50-250 nm.

**CaLoSiL-E50:** Strengthening of highly porous materials, filling of micro cracks and small voids; contains 50 g/L Ca(OH)<sub>2</sub>, Particle size: 50-250 nm. CaLoSiL is a ready-to-

use stone and plasters consolidate. Treatment of stone, mortar or plaster with CaLoSiL results in the formation of solid calcium hydroxide after evaporation of the alcohol. That converts into calcium carbonate in a way similar to traditional lime mortars by reaction with atmospheric carbon dioxide. All alcohols evaporate without any residues. Chemicals or residues deteriorating stone or mortar are not formed. CaLoSiL offers very good adhesion properties to mineral building materials, especially calcareous ones. A combination with silicic acid ester (pre-treatment with CaLoSiL) is possible and maintain to higher stability, because of the "glueing" properties of CaLoSiL.

One negative effect could be the so called "white haze formation", which might be either caused by wrong application methods or by back-migration of the consolidant. Using other concentrations, other alcohols (Iso-Propanol or n-Propanol) and pre-testing of different application and curing methods can prevent this effect.

2.

COMPILER	
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<b>Partner name</b>	IATCS
<b>Country</b>	AUSTRIA



Horizon 2020



PRODUCT	
Trade name	CALOSIL IP-5, CALOSIL IP-25
Company	IBZ-SALZCHEMIE GMBH
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	EU-Project, 7th framework "STONECORE" (Grant agreement No 213651)
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	Ca(OH) <sub>2</sub>
Others (specify)	
Nanoparticle concentration	5 g/l, 25 g/l

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Isopropanol
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
Same range of application as CaLoSiL-E (Ethanol), but <u>longer time of evaporation</u> = isopropanol



Horizon 2020



3.

COMPILER	
Partner name	IATCS
Country	AUSTRIA

PRODUCT	
Trade name	CALOSIL-NP5, CALOSIL-NP25
Company	IBZ-SALZCHEMIE GMBH
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	EU-Project, 7th framework "STONECORE" (Grant agreement No 213651)
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	Ca(OH) <sub>2</sub>
Others (specify)	
Nanoparticle concentration	5 g/l, 25 g/l

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	n-Propanol
Others (specify)	

Additives
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Horizon 2020



<b>Additives</b>	NO
<b>Others (specify)</b>	

NOTES
Same range of application as CaLoSiL-E (Ethanol), but <u>long time of evaporation</u> = n-Propanol

4.

COMPILER	
<b>Partner name</b>	IATCS
<b>Country</b>	AUSTRIA

PRODUCT	
<b>Trade name</b>	LUDOX PX30 and PW30 (former SYTON X30, W30))
<b>Company</b>	KREMER PIGMENTE GMBH
<b>Country</b>	Germany
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

Information about the product	
<b>Information obtained from:</b>	Technical and safety data sheet
<b>Others (specify)</b>	
<b>Technical/Scientific published reference</b>	

Active ingredient from technical data sheet	
<b>Active ingredient</b>	Nanoparticles
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	SiO <sub>2</sub>
<b>Others (specify)</b>	colloidal SiO <sub>2</sub>
<b>Nanoparticle concentration</b>	30%



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
<p><b>Ludox PX30</b> (former Syton X30): particle size approx. 12 nm  <b>Ludox W30</b> (former Syton W30): particle size approx. 25 nm.            Used for consolidation of stone (mainly surfaces), and plasters, binder in mortar and coatings.</p>

5.

COMPILER	
Partner name	COLOROBIA
Country	ITALY

PRODUCT	
Trade name	PARNASOS ZG000001
Company	COLOROBIA CONSULTING SRL
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	



Horizon 2020



Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	ZrO2
Others (specify)	
Nanoparticle concentration	4% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
pH suspension = 1,0

6.

COMPILER	
Partner name	COLOROBBIA
Country	ITALY

PRODUCT	
Trade name	PARNASOS ZG000002
Company	COLOROBBIA CONSULTING SRL
Country	Italy
Main property of the product	Consolidant
Others (specify)	



Horizon 2020



Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	ZrO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	3,5% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
pH suspension = 5,0

7.

COMPILER	
Partner name	COLOROBIA



Horizon 2020



Country	ITALY
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PRODUCT	
Trade name	PARNASOS ZG000009
Company	COLOROBBIA CONSULTING SRL
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	30% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	NO
Others (specify)	

8.

COMPILER
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NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage

Grant Agreement no: 646178

53/173



Horizon 2020



<b>Partner name</b>	COLOROBIA
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	PARNASOS ZG000012
<b>Company</b>	COLOROBIA CONSULTING SRL
<b>Country</b>	Italy
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

Information about the product	
<b>Information obtained from:</b>	Technical and safety data sheet
<b>Others (specify)</b>	
<b>Technical/Scientific published reference</b>	

Active ingredient from technical data sheet	
<b>Active ingredient</b>	Nanoparticles
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	SiO <sub>2</sub>
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	13% w/w

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Aqueous dispersion
<b>Specify solvent</b>	Water/ethanol
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	NO
<b>Others (specify)</b>	

9.

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage

Grant Agreement no: 646178

54/173



Horizon 2020



COMPILER	
Partner name	COLOROBRIA
Country	ITALY

PRODUCT	
Trade name	PARNASOS ZG000014
Company	COLOROBRIA CONSULTING SRL
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	Al <sub>2</sub> O <sub>3</sub>
Others (specify)	
Nanoparticle concentration	3% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

NOTES	
pH suspension = 3,0	Disperdent = Triton X-100



Horizon 2020



10.

COMPILER	
Partner name	IATCS
Country	AUSTRIA

PRODUCT	
Trade name	SIOXAL
Company	IBZ-SALZCHEMIE GMBH
Country	Germany
Main property of the product	Consolidant
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	Depending on product: see Notes

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	anionic SiO <sub>2</sub>
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	





Horizon 2020



Additives	
Additives	NO
Others (specify)	

NOTES
<p><b>SioXaL A8</b> anionic silica, 15 % solid content, 8 nm mean particle size <b>SioXaL A10</b> anionic silica, 30 % solid content, 10 nm mean particle size <b>SioXaL A35</b> anionic silica, 30 % solid content, 35 nm mean particle size</p> <p>Because of the chemical stability of silica after drying, SioXaL is recommended as a very good combination for:</p> <ul style="list-style-type: none"><li>· consolidation of sanding, powder surfaces</li><li>· binder in mortars</li><li>· filler</li><li>· consolidation of loose sediments</li><li>· masonry draining</li><li>· additive for paints</li><li>· manufacture stone replacement masses</li><li>· impregnation of stone, mortar, plaster</li><li>· concrete waterproofing, concrete coating</li></ul>



Horizon 2020



## 4.2 Protective coatings

### 4.2.1 Alkyl-alcoxy-silane oligomers

1.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	BSO 166
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Alkyl-alcoxy-silane oligomers
Concentration	100%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	NO



Horizon 2020



<b>Others (specify)</b>	
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NOTES	
Alkyl alcoxy silane oligomers, low molecular weight, thinnable in alcohol or hydrocarbon solvent	

2.

COMPILER	
<b>Partner name</b>	CHEM SPEC
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	BSR 80/7
<b>Company</b>	CHEM SPEC SRL
<b>Country</b>	Italy
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

Information about the product	
<b>Information obtained from:</b>	Technical and safety data sheet
<b>Others (specify)</b>	
<b>Technical/Scientific published reference</b>	

Active ingredient from technical data sheet	
<b>Active ingredient</b>	Alkyl-alkoxy-silane oligomers
<b>Concentration</b>	80%

Nanoparticles	
<b>Nanoparticles</b>	NO
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Hydrocarbon
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	

3.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	DYNASYLAN BSM 40 SKI
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	Antifouling, Antibacteria

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Alkyl alcoxy-silane monomer
Concentration	40%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Isopropanol
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	

NOTES
Water repellent, low molecular weight, high penetration, no color change.

4.

COMPILER	
Partner name	IATCS
Country	AUSTRIA

PRODUCT	
Trade name	MATROXX NST
Company	MATROXX GMBH
Country	Austria
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Activated Silica Nanoparticles
Concentration	Not specified

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	not specified

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	Distilled Water
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

NOTES
<p>Recipe: Nanosilica unbound, activated.            Application: One application (usually by spraying) is sufficient. Can also be applied to moist substrate.            No polymerization or other chemical reaction.            Hydrophobic actions starts immediately once the water has evaporated; no film formation.            The product is not yet used in cultural heritage protection. A small research project for porous stone is currently performed by IATCS.</p>

5.

COMPILER	
Partner name	OPAE
Country	ITALY

PRODUCT	
Trade name	RHODORSIL H224
Company	RHONE-POULENC
Country	France
Main property of the product	Protective
Others (specify)	



Horizon 2020



#### Information about the product

Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

#### Active ingredient from technical data sheet

Active ingredient	Siloxane oligomers
Concentration	Density 0,97g/cm <sup>3</sup>

#### Nanoparticles

Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

#### Solvent/dispersing medium

Solvent/dispersing medium	Organic solvent
Specify solvent	White spirit
Others (specify)	

#### Additives

Additives	NO
Others (specify)	

#### NOTES

Used for protection of the Leaning Tower of Pisa

6.

#### COMPILER

Partner name	INSTM
Country	ITALY

#### PRODUCT

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Trade name	SILO 111
Company	CTS
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Alkyl-alcoxy-silane oligomers
Concentration	10%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	White Spirit D 40 (denatured)
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES





Horizon 2020



7.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	SILO 112
Company	CTS
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Alkyl-alcoxy-silane oligomers
Concentration	10%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersions
Specify solvent	Demineralized water
Others (specify)	

Additives	
Additives	NO
Others (specify)	



Horizon 2020



**NOTES**

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8.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	SIOX-5
<b>Company</b>	SILTEA
<b>Country</b>	Italy
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

**PROTECTIVE/ANTIFOULING**

<b>Chemical class</b>	Alkyl-alcoxy-silane oligomers
<b>Others (specify)</b>	Silica

**Active ingredient from technical data sheet**

<b>Active ingredient</b>	
<b>Concentration</b>	

**Nanoparticles**

<b>Nanoparticles</b>	NO
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

**Solvent/dispersing medium**

<b>Solvent/dispersing medium</b>	Organic medium dispersion
<b>Specify solvent</b>	Isopropanol
<b>Others (specify)</b>	



Horizon 2020



Additives	
Additives	NO
Others (specify)	

NOTES

9.

COMPILER	
Partner name	ISCR
Country	Italy

PRODUCT	
Trade name	Tegosivin
Company	Evonik
Country	Germany
Main property of the product	Protective/water repellent
Others (specify)	Consolidant

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Ethoxyfunctional oligomeric siloxane
Concentration	100%

Nanoparticles	
Nanoparticles	NO
Others (specify)	



Horizon 2020



Nanoparticle concentration	
----------------------------	--

Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	Solventless

Additives	
Additives	NO
Others (specify)	

NOTES

10.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	VP 1805
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet
---

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Active ingredient</b>	Alkyl-alcoxy-silane oligomers
<b>Concentration</b>	50%

Nanoparticles	
<b>Nanoparticles</b>	NO
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Aqueous solution
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	Surfactant
<b>Others (specify)</b>	

NOTES
Water repellent, concentrated in water dispersion applied on a porous substrate like tuff.

11.

COMPILER	
<b>Partner name</b>	OPAE
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	WACKER 290
<b>Company</b>	WACKER
<b>Country</b>	Germany
<b>Main property of the product</b>	Protective
<b>Others (specify)</b>	



Horizon 2020



### Information about the product

Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

### Active ingredient from technical data sheet

Active ingredient	Siloxane oligomers
Concentration	Density 1,05 g/cm <sup>3</sup>

### Nanoparticles

Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

### Solvent/dispersing medium

Solvent/dispersing medium	Organic solvent
Specify solvent	Aliphatic and aromatic hydrocarbons
Others (specify)	

### Additives

Additives	NO
Others (specify)	

### NOTES

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Horizon 2020



## 4.2.2 Alkyl-aril-polysiloxanes

1.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	SILIRAIN 50 (former Silirain 50 Bluestar)
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Methyl Siloxane oligomer
Concentration	60%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Hydrocarbon
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	



Horizon 2020



NOTES	

### 4.2.3 Fluorinated or partially fluorinated polymers

1.

COMPILER	
Partner name	DNO-OSLO
Country	NORWAY

PRODUCT	
Trade name	FACEAL OLEO HD
Company	ALL REMOVE NORGE AS
Country	Norway
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	<a href="http://www.keim.com/portals/0/app/clientre-sources/documents/Faceal%20Oleo%20HD%20(US)%2005%202013c346032225a4ced8871772ab9bbbd39.pdf">http://www.keim.com/portals/0/app/clientre-sources/documents/Faceal%20Oleo%20HD%20(US)%2005%202013c346032225a4ced8871772ab9bbbd39.pdf</a>
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Functionally substituted fluorinated acrylic copolymer
Concentration	

Nanoparticles	
Nanoparticles	NO

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage





Horizon 2020



<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Aqueous dispersion
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	NO
<b>Others (specify)</b>	

NOTES

2.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	FLUOLINE PE
<b>Company</b>	CTS
<b>Country</b>	Italy
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

Information about the product	
<b>Information obtained from:</b>	Technical and safety data sheet
<b>Others (specify)</b>	
<b>Technical/Scientific published reference</b>	



Horizon 2020



Active ingredient from technical data sheet	
Active ingredient	Functionalized fluoropolyethers
Concentration	10%

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	
Others (specify)	

3.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	FLUOLINE HY
Company	CTS
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	Reaggregating, hydro/oil repellent

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	



Horizon 2020



Active ingredient from technical data sheet	
Active ingredient	Fluorinated elastomer
Concentration	

Nanoparticles	
Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic dispersing medium
Specify solvent	Acetone/butyl acetate
Others (specify)	

Additives	
Additives	NO
Others (specify)	

NOTES
Anti-graffiti

#### 4.2.4 Low molecular weight inorganics

1.

COMPILER	
Partner name	COLOROBRIA
Country	ITALY

PRODUCT	
Trade name	PARNASOS IG000005
Company	COLOROBRIA CONSULTING SRL

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Country</b>	Italy
<b>Main property of the product</b>	Antifouling, Antibacteria
<b>Others (specify)</b>	

Information about the product	
<b>Information obtained from:</b>	Technical and safety data sheet
<b>Others (specify)</b>	
<b>Technical/Scientific published reference</b>	

Active ingredient from technical data sheet	
<b>Active ingredient</b>	Nanoparticles
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	Ag
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	4% w/w

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Aqueous dispersion
<b>Specify solvent</b>	Water
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	Surfactant
<b>Others (specify)</b>	

NOTES	
pH suspension = 3,0      Disperdent = polyvinylpyrrolidone	

2.



Horizon 2020



COMPILER	
Partner name	COLOROBRIA
Country	ITALY

PRODUCT	
Trade name	PARNASOS IG000030
Company	COLOROBRIA CONSULTING SRL
Country	Italy
Main property of the product	Antifouling, Antibacteria
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	ZnO
Others (specify)	
Nanoparticle concentration	1% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Diethylen glycol
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

## NOTES

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage

Grant Agreement no: 646178

77/173



Horizon 2020



Disperdent = polyvinylpyrrolidone

Scale up to 5 Kg

3.

COMPILER	
Partner name	COLOROBIA
Country	ITALY

PRODUCT	
Trade name	PARNASOS PH000025
Company	COLOROBIA CONSULTING SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	6% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	



Horizon 2020



Additives	
Additives	Surfactant
Others (specify)	

NOTES
pH suspension = 1,0      Disperdent = Triton X-100

4.

COMPILER	
Partner name	COLOROBRIA
Country	ITALY

PRODUCT	
Trade name	PARNASOS PH000026
Company	COLOROBRIA CONSULTING SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	
Technical/Scientific published reference	

Active ingredient from technical data sheet	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	6% w/w



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

NOTES
pH suspension = 5,5

## 4.2.5 Vegetable polysaccharides

1.

COMPILER	
Partner name	DNO-OSLO
Country	NORWAY

PRODUCT	
Trade name	PS S 20
Company	ALL REMOVE NORGE AS
Country	Norway
Main property of the product	Protective/water repellent
Others (specify)	Anti-graffiti

Information about the product	
Information obtained from:	Technical and safety data sheet
Others (specify)	Anti- graffiti
Technical/Scientific published reference	<a href="http://www.allremove.dk/assets/Uploads/shdtbpps20dk.pdf">http://www.allremove.dk/assets/Uploads/shdtbpps20dk.pdf</a>

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage

Grant Agreement no: 646178

80/173





Horizon 2020



<http://www.equus.co.nz/content/datasheet-pdf/PSS20.pdf>

#### Active ingredient from technical data sheet

Active ingredient	Vegetable polysaccharides
Concentration	

#### Nanoparticles

Nanoparticles	NO
Others (specify)	
Nanoparticle concentration	

#### Solvent/dispersing medium

Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	

#### Additives

Additives	NO
Others (specify)	

#### NOTES

--



## 5 Database on research products

### 5.1 Consolidants

#### 5.1.1 Alkoxy-silane and oligomers

1.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	H A IPA
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Consolidant
Others (specify)	Antifouling, Antibacteria

Technical/Scientific published reference	
--	--

Active ingredient	
Active ingredient	Alkyl-alkoxy-silane oligomers/Nanoparticles
Concentration	70%-75% polymer

Nanoparticles	
Nanoparticles	Ag
Others (specify)	
Nanoparticle concentration	0,01 - 0,1%

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	White spirit
Others (specify)	

Additives	
Additives	Catalyst



Horizon 2020



Others (specify)	
------------------	--

#### Application on stone substrates

Stone substrate	Sandstone
Others (specify)	Marble, Granite, Terracotta

#### Application method

Application method	Brush
Others (specify)	Spray, Immersion

#### NOTES

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2.

#### COMPILER

Partner name	CHEM SPEC
Country	ITALY

#### PRODUCT

Trade name	H.A.I. - IPA
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Consolidant
Others (specify)	Protective/water repellent - Antifouling antib.

Technical/Scientific published reference	
--	--

#### Active ingredient

Active ingredient	Alkyl-alcoxy-silane oligomers/Nanoparticles
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Horizon 2020



<b>Concentration</b>	75% polymer
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Nanoparticles	
<b>Nanoparticles</b>	Ag
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	20 100 ppm

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	Catalyst
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Sandstone
<b>Others (specify)</b>	Limestone, Marble, Granite, Terracotta

Application method	
<b>Application method</b>	Brush
<b>Others (specify)</b>	Spray, Immersion

NOTES	
Elastic stone hardner	

3.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



PRODUCT	
Trade name	
Company	
Country	South Korea
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Kim, Won, Do, Kim, Kang. Journal of Cultural Heritage (2009), 10(2), 214
--	--

Active ingredient	
Active ingredient	TEOS/GPTMS and SiO <sub>2</sub> nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	1, 3, 5 wt.%

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	Tetraethoxysilane (TEOS), (3-glycidoxypropyl) trimethoxysilane (GPTMS); TEOS: GPTMS (1:0, 2:1, 1:1, 1:2)
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	DBLT

Application on stone substrates	
Stone substrate	Granite
Others (specify)	



Horizon 2020



Application method	
Application method	Immersion
Others (specify)	Capillarity absorption

NOTES

4.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	
Country	Greece
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Ksinopoulou, Bakolas, Moropoulou. Journal of Nano Research (2014), 27, 143
--	---

CONSOLIDANT	
Chemical class	Alkoxy-silane and oligomers
Others (specify)	

PROTECTIVE/ANTIFOULING	
Chemical class	
Others (specify)	

Active ingredient
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Horizon 2020



<b>Active ingredient</b>	Ethyl silicate matrix loaded with colloidal titania (TiO <sub>2</sub> ) particles and silica (SiO <sub>2</sub> ) nano-particles
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	TiO <sub>2</sub>
<b>Others (specify)</b>	SiO <sub>2</sub>
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	
<b>Others (specify)</b>	

NOTES

5.

COMPILER
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NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Nanchang University
Country	China
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Li, Xu et al. Applied Surface Science (2013), 266, 368
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Active ingredient	
Active ingredient	TEOS/PDMS-OH
Concentration	8%

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	0,1-0,4%

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Ethanol
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	di-n-butyltin dilaurate

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	





Horizon 2020



Application method	
Application method	Brush
Others (specify)	

NOTES

6.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Shanghai Institute of Ceramics/Chinese Academy of Sciences/Shanghai University
Country	China
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Liu, Han, Huang, Li, Luo. J. Sol-Gel Sci. Technol. (2013), 68, 19
--	---

Active ingredient	
Active ingredient	TEOS/PDMS-OH
Concentration	20/1 %w

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	1-4 %w



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Isopropanol
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	

Application on stone substrates	
Stone substrate	Sandstone
Others (specify)	

Application method	
Application method	Immersion
Others (specify)	

NOTES

7.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Sichuan University,
Country	China
Main property of the product	Consolidant
Others (specify)	



Horizon 2020



<b>Technical/Scientific published reference</b>	Luo, Xiao, Zhang. Journal of Cultural Heritage (2015), 16, 470
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<b>Active ingredient</b>	
<b>Active ingredient</b>	Nanoparticles modified TEOS/PDMS
<b>Concentration</b>	

<b>Nanoparticles</b>	
<b>Nanoparticles</b>	HAP
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	0,5-2 %

<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	
<b>Specify solvent</b>	
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	Catalyst
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	Sandstone
<b>Others (specify)</b>	

<b>Application method</b>	
<b>Application method</b>	Brush
<b>Others (specify)</b>	

<b>NOTES</b>	



Horizon 2020



8.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	University of Perugia/Princeton university
Country	Italy/USA
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	C. Miliani, M.L. Velo-Simpson;, G.W. Scherer; Journal of Cultural Heritage 8 (2007) 1-6
--	---

Active ingredient	
Active ingredient	TEOS/nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	TiO2
Others (specify)	and Al2O3 and SiO2
Nanoparticle concentration	5-10% in volume

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	2-propanol
Others (specify)	

Additives	
Additives	
Others (specify)	



Horizon 2020



Application on stone substrates	
Stone substrate	Sandstone
Others (specify)	

Application method	
Application method	Immersion
Others (specify)	

NOTES

9.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Cadiz/University of Vigo
Country	Spain
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Mosquera, de los Santos, Rivas et al. Journal of Nano Research (2009), 8, 1
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Active ingredient	
Active ingredient	TEOS /PDMS-OH
Concentration	

Nanoparticles	
Nanoparticles	Ag
Others (specify)	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Nanoparticle concentration</b>	
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<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	Ethanol
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	Surfactant
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	Granite

<b>Application method</b>	
<b>Application method</b>	Brush
<b>Others (specify)</b>	

<b>NOTES</b>

10.

<b>COMPILER</b>	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

<b>PRODUCT</b>	
<b>Trade name</b>	
<b>Company</b>	University of Cadiz/University of Vigo
<b>Country</b>	Spain



Horizon 2020



<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Mosquera, de los Santos, Rivas. Langmuir (2010), 26(9), 6737
---	--

Active ingredient	
<b>Active ingredient</b>	TEOS /PDMS-OH
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	Ethanol
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	Surfactant
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	Brush
<b>Others (specify)</b>	

NOTES



Horizon 2020



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11.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	Universidad de Cádiz
Country	Spain
Main property of the product	Consolidant
Others (specify)	self-cleaning

Technical/Scientific published reference	L.Pinho, F.Elhaddad, D.S. Facio, M.J. Mosquera; Applied Surface Science 275 (2013) 389–396.
--	---

Active ingredient	
Active ingredient	TiO <sub>2</sub> -SiO <sub>2</sub> nanocomposite
Concentration	

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	Surfactant





Horizon 2020



Others (specify)	
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Application on stone substrates	
Stone substrate	Sandstone
Others (specify)	

Application method	
Application method	Spray
Others (specify)	

NOTES
a sol containing silica oligomers, titania particles and a non-ionic surfactant (n-octylamine).

12.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Guanajuato
Country	Mexico
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Salazar-Hernandez et al. Appl. Organometal. Chem. (2010), 24, 481
--	---

Active ingredient	
Active ingredient	TEOS/PDMS-OH
Concentration	50-75/20 %w



Horizon 2020



Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	5-30 %w

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Ethanol/MEK
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	

Application on stone substrates	
Stone substrate	
Others (specify)	Tuff

Application method	
Application method	Brush
Others (specify)	

NOTES

13.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT



Horizon 2020



<b>Trade name</b>	
<b>Company</b>	Department of Chemistry, Sejong University
<b>Country</b>	South Korea
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Son, Won, Kim, Jang, Kang, Kim. Applied Materials & Interfaces (2009), 1(2), 393
---	--

<b>Active ingredient</b>	
<b>Active ingredient</b>	Modified TEOS
<b>Concentration</b>	35-50%

<b>Nanoparticles</b>	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	Polyhedral oligomeric silsesquioxane
<b>Nanoparticle concentration</b>	1-3%

<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	Ethanol
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	Catalyst
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	Granite
<b>Others (specify)</b>	

<b>Application method</b>	
<b>Application method</b>	Immersion
<b>Others (specify)</b>	



Horizon 2020



**NOTES**

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14.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	
<b>Company</b>	Technical University of Crete
<b>Country</b>	Greece
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Verganelaki et al. Ind. Eng. Chem. Res. (2015), 54, 7195
---	--

**Active ingredient**

<b>Active ingredient</b>	TEOS
<b>Concentration</b>	

**Nanoparticles**

<b>Nanoparticles</b>	
<b>Others (specify)</b>	Calcium Oxalate Monohydrate
<b>Nanoparticle concentration</b>	

**Solvent/dispersing medium**

<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	2-Propanol
<b>Others (specify)</b>	



Horizon 2020



Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	

Application method	
Application method	Brush
Others (specify)	

NOTES
Calcium Oxalate Monohydrate obtained in situ by calcium hydroxide and oxalic acid

15.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Columbia University/University of Guanajuato
Country	USA/Mexico
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Zárraga et al. Journal of Cultural Heritage (2010), 11, 138
--	---

### Active ingredient

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Active ingredient</b>	TEOS/PDMS-OH
<b>Concentration</b>	

<b>Nanoparticles</b>	
<b>Nanoparticles</b>	SiO <sub>2</sub>
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	Catalyst
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	Sandstone
<b>Others (specify)</b>	

<b>Application method</b>	
<b>Application method</b>	Spray
<b>Others (specify)</b>	

<b>NOTES</b>	



Horizon 2020



## 5.1.2 Epoxy polymers

1.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Università di Messina/IPCF-CNR
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Cardiano et al. Polymer (2005), 46, 1857
--	--

Active ingredient	
Active ingredient	2-(3,4-Epoxy cyclohexyl)ethyl-trimethoxysilane, (3-glycidyl oxypropyl)methyldiethoxysilane and (3-aminopropyl)triethoxysilane
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Ethanol
Others (specify)	

Additives	
Additives	
Others (specify)	



Horizon 2020



Application on stone substrates	
Stone substrate	Sandstone
Others (specify)	Limestone

Application method	
Application method	Immersion
Others (specify)	Capillarity

NOTES

### 5.1.3 Acrylics

1.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Florence
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Carretti, Chelazzi, Rocchigiani, Baglioni, Poggi, Dei. Langmuir (2013), 29, 9881
--	--

Active ingredient	
Active ingredient	Acrylic copolymer
Concentration	2,5%





Horizon 2020



Nanoparticles	
Nanoparticles	Ca(OH) <sub>2</sub>
Others (specify)	CaOH
Nanoparticle concentration	0,5%

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	2-propanol/acetone
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	
Others (specify)	

Application method	
Application method	
Others (specify)	

NOTES

2.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT



Horizon 2020



<b>Trade name</b>	
<b>Company</b>	ENEA-UTAPRAD and ENEA-UTTMAT
<b>Country</b>	Italy
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	D'Amato, Caneve, Giancristofaro, Persia, Pilloni and Rinaldi; J Nanoengineering and Nanosystems 2014, Vol. 228(1) 19–26
---	---

Active ingredient	
<b>Active ingredient</b>	Nanoparticles modified Paraloid B72
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	SiO <sub>2</sub>
<b>Others (specify)</b>	and TiO <sub>2</sub>
<b>Nanoparticle concentration</b>	0,1 - 2 %

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Organic medium
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Marble
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	Brush
<b>Others (specify)</b>	



Horizon 2020



### NOTES

3.

### COMPILER

<b>Partner name</b>	INSTM
<b>Country</b>	Italy

### PRODUCT

<b>Trade name</b>	
<b>Company</b>	Università della Calabria/Università di Catania
<b>Country</b>	Italy
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	Self-cleaning

<b>Technical/Scientific published reference</b>	Mauro F. La Russa et al.; Progress in Organic Coatings 74 (2012) 186–19
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### Active ingredient

<b>Active ingredient</b>	TiO <sub>2</sub> /in acrylic polymer emulsion
<b>Concentration</b>	0,3%

### Nanoparticles

<b>Nanoparticles</b>	TiO <sub>2</sub>
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

### Solvent/dispersing medium

<b>Solvent/dispersing medium</b>	Aqueous dispersion
<b>Specify solvent</b>	
<b>Others (specify)</b>	



Horizon 2020



Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	and limestone

Application method	
Application method	Brush
Others (specify)	

NOTES

## 5.1.4 Inorganics

1.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	University of Calabria/university of Rome/INRS-EMT
Country	Italy/Canada
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	M. Barberio, S. Veltri, A. Imbrogno, F. Stranges, A. Bonanno, P. Antici; Surface & Coatings Technology 271 (2015) 174–180
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Horizon 2020



Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	and SiO <sub>2</sub>
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	Aceton
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	
Others (specify)	Ceramic

Application method	
Application method	
Others (specify)	Spray dry

NOTES	
Using LASiS, we grow NPs with dimensions of about 10 and 15 nm, for SiO <sub>2</sub> and TiO <sub>2</sub> , respectively, and spray-dried the colloidal solution on ceramic artifact surface	

2.

COMPILER	
Partner name	INSTM

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Country	ITALY
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PRODUCT	
Trade name	
Company	University of Florence
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Chelazzi, Poggi, Jaidar, Toccafondi, Giorgi, Baglioni. J. Colloid. Interface Sci. (2013), 392, 42
--	---

Active ingredient	
Active ingredient	
Concentration	

Nanoparticles	
Nanoparticles	Ca(OH) <sub>2</sub>
Others (specify)	Mg(OH) <sub>2</sub> , Ba(OH) <sub>2</sub>
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	Limestone



Horizon 2020



Application method	
Application method	
Others (specify)	

NOTES
Review

3.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	University of Catania
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	E. Ciliberto; G.G. Condorelli; S. La Delfa; E. Viscuso; Appl. Phys. A 92, (2008), 137–141
--	---

Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	Sr(OH) <sub>2</sub>
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	



Horizon 2020



<b>Specify solvent</b>	Propan-1-ol
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	
<b>Others (specify)</b>	

NOTES
In fact, in vitro experiences have revealed that Sr(OH) <sub>2</sub> is able to react both with atmospheric carbon dioxide and with sulphate ions arising from gypsum. Thus as a new sacrificial material it can be used in wall painting and plaster restoration without the toxicity problems typical of barium hydroxide solutions.

4.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	Italy

PRODUCT	
<b>Trade name</b>	
<b>Company</b>	University of L'Aquila
<b>Country</b>	Italy
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Valeria Daniele , Giuliana Taglieri; Journal of Cultural Heritage 11 (2010) 102–106
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NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage





Horizon 2020



Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	Ca(OH) <sub>2</sub>
Others (specify)	
Nanoparticle concentration	2-10 mg/ml

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	2-propanol
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	"Pietra di Lecce", "Pietra Serena", "Basalto", "Perla d'Abruzzo" and "Poggio Picenze"

Application method	
Application method	Brush
Others (specify)	

NOTES



Horizon 2020



5.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Istituto di Chimica Inorganica e delle Superfici, C.N.R.
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Favaro, Tomasin, Ossola, Vigato. Appl. Organometal. Chem. (2008), 22, 698
--	---

Active ingredient	
Active ingredient	Calcium alkoxides
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	Methanol
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	



Horizon 2020



<b>Others (specify)</b>	Glass frit generally used for chemical filtration
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Application method	
<b>Application method</b>	
<b>Others (specify)</b>	Imbibition, Percolation

NOTES

6.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	Italy

PRODUCT	
<b>Trade name</b>	
<b>Company</b>	University of Pavia
<b>Country</b>	Italy
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Maurizio Licchelli · Marco Malagodi · Maduka Weththimuni · Chiara Zanchi; Appl Phys A (2014) 114:673–683
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Active ingredient	
<b>Active ingredient</b>	Nanoparticles
<b>Concentration</b>	

### Nanoparticles

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Nanoparticles</b>	Ca(OH) <sub>2</sub>
<b>Others (specify)</b>	SiO <sub>2</sub> , Sr(OH) <sub>2</sub>
<b>Nanoparticle concentration</b>	3 g/l

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Organic medium dispersion
<b>Specify solvent</b>	2-propanol
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	Brush
<b>Others (specify)</b>	and capillary absorption

NOTES
In conclusion, 2-propanol dispersions of Ca(OH) <sub>2</sub> and Sr(OH) <sub>2</sub> NPs can be considered as promising strengthening agents for very porous bio-calcarene substrates such as Lecce stone

7.

COMPILER	
<b>Partner name</b>	COLOROBRIA
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	NAMA17
<b>Company</b>	Colorobbia Consulting s.r.l.
<b>Country</b>	Italy

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	
--	--

Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	HAP
Others (specify)	
Nanoparticle concentration	9,5% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	
Others (specify)	

Application method	
Application method	
Others (specify)	

NOTES	
pH = 8,0	Presence of ammonia



Horizon 2020



8.

COMPILER	
Partner name	COLOROBIA
Country	ITALY

PRODUCT	
Trade name	NAMA18
Company	Colorobbia Consulting s.r.l.
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	
--	--

Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	HAP
Others (specify)	
Nanoparticle concentration	2,5% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Diethylen glycol
Others (specify)	

Additives	
Additives	
Others (specify)	



Horizon 2020



**Application on stone substrates**

<b>Stone substrate</b>	
<b>Others (specify)</b>	

**Application method**

<b>Application method</b>	
<b>Others (specify)</b>	

**NOTES**

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9.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	
<b>Company</b>	ICECHIM-Bucharest/Valahia University/ Ovidius University
<b>Country</b>	Romania
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Ion, Turcanu-Carutiu, Fierascu, Fierascu, Bunghez, Ion, Teodorescu, Vasilevici, Raditoiu. Applied Surface Science (2015) article in press
---	---

**Active ingredient**

<b>Active ingredient</b>	Calcium oxalate trihydrate/Hydroxyapatite
<b>Concentration</b>	5% /10%



Horizon 2020



Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	Water
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	

Application method	
Application method	Spray
Others (specify)	Brushing

NOTES

10.

COMPILER	
Partner name	INSTM
Country	ITALY





Horizon 2020



PRODUCT	
Trade name	
Company	University of Granada
Country	Spain
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Molina Piernas, Rueda Quero, Cultrone, Ruiz Agudo. Geoph. Res. Abstracts 17 (2015)
--	--

Active ingredient	
Active ingredient	Diammonium hydrogen phosphate
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	Water
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	

Application method	
Application method	



Horizon 2020



Others (specify)	
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NOTES	

11.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Firenze & Palermo
Country	Italy
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Natali, et al. Journal of Cultural Heritage (2014), 15, 151
--	---

Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	Ca(OH) <sub>2</sub>
Nanoparticle concentration	0.5 wt/vol%

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion



Horizon 2020



<b>Specify solvent</b>	2-propanol/water 9/1
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	
<b>Others (specify)</b>	Lime based mortar

Application method	
<b>Application method</b>	Brush
<b>Others (specify)</b>	

NOTES

12.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	
<b>Company</b>	Istituto di Chimica Inorganica e delle Superfici, C.N.R.
<b>Country</b>	Italy
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	



Horizon 2020



<b>Technical/Scientific published reference</b>	Ossola et al. New J. Chem. (2012), 36, 2618
---	---

<b>Active ingredient</b>	
<b>Active ingredient</b>	Calcium alkoxide
<b>Concentration</b>	equivalent to 2.5 g /L of Ca

<b>Nanoparticles</b>	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	Isopropanol
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	Marble
<b>Others (specify)</b>	

<b>Application method</b>	
<b>Application method</b>	Immersion
<b>Others (specify)</b>	

<b>NOTES</b>	



Horizon 2020



13.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Bologna/Princeton University
Country	Italy/USA
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Sassoni, Franzoni, Pigino, Scherer, Naidu. Journal of Cultural Heritage (2013), 14, 3 SUPPL., e103
--	--

CONSOLIDANT	
Chemical class	Low molecular weight inorganics
Others (specify)	

PROTECTIVE/ANTIFOULING	
Chemical class	
Others (specify)	

Active ingredient	
Active ingredient	Diammonium hydrogen phosphate
Concentration	1M, 3 M

Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Specify solvent</b>	Water
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Sandstone
<b>Others (specify)</b>	Marble

Application method	
<b>Application method</b>	Brush
<b>Others (specify)</b>	

NOTES
Other references: Graziani, Sassoni, Franzoni. Heritage Science (2015), 3, 1; Sassoni, Franzoni. Applied Physics A (2014), 117, 4, 1893

14.

COMPILER	
<b>Partner name</b>	OPAE
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	ZARGUN 260011
<b>Company</b>	COLOROBIA ITALIA SPA
<b>Country</b>	Italy
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Technical and safety data sheet
---	---------------------------------



Horizon 2020



Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	Amorphous hydrate silicate
Nanoparticle concentration	$40 \leq C < 60$

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersions
Specify solvent	Water and ethanol
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Apuan marble
Others (specify)	

Application method	
Application method	
Others (specify)	Total immersion

NOTES
Used in experimentation on Leaning Tower in Pisa (2007)

15.

COMPILER	
Partner name	OPAE

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage

Grant Agreement no: 646178

127/173



Horizon 2020



Country	ITALY
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PRODUCT	
Trade name	ZARGUN 260012
Company	COLOROBIA ITALIA SPA
Country	ITALY
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Technical and safety data sheets
--	----------------------------------

Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	Amorphous hydrate silicate
Nanoparticle concentration	$9 \leq C < 25$

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	Ethanol
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Apuan marble
Others (specify)	

Application method	
Application method	





Horizon 2020



<b>Others (specify)</b>	<b>Total immersion</b>
-------------------------	------------------------

NOTES
Used on Leaning Tower in Pisa (2008)

### 5.1.5 Biomineralization

1.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	
<b>Company</b>	CNRS/INSU ISTO-UMR
<b>Country</b>	France
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Anne et al. Construction and Building Materials (2010), 24, 1036
---	--

Active ingredient	
<b>Active ingredient</b>	B. cereus
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	



Horizon 2020



<b>Specify solvent</b>	
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	
<b>Others (specify)</b>	Plaster

<b>Application method</b>	
<b>Application method</b>	Spray
<b>Others (specify)</b>	

<b>NOTES</b>

2.

<b>COMPILER</b>	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

<b>PRODUCT</b>	
<b>Trade name</b>	
<b>Company</b>	Ghent University
<b>Country</b>	Belgium
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	



Horizon 2020



<b>Technical/Scientific published reference</b>	De Muyncka, De Beliea, Verstraete. Ecological Engineering (2010), 36, 118
---	--

<b>Active ingredient</b>	
<b>Active ingredient</b>	Various bacterial strains
<b>Concentration</b>	

<b>Nanoparticles</b>	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	
<b>Specify solvent</b>	
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	
<b>Others (specify)</b>	Various

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	
<b>Others (specify)</b>	Various stones

<b>Application method</b>	
<b>Application method</b>	
<b>Others (specify)</b>	Various

<b>NOTES</b>	



Horizon 2020



3.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Granada /University of Vienna
Country	Spain/Austria
Main property of the product	Consolidant
Others (specify)	

Technical/Scientific published reference	Jimenez-Lopez et al. Chemosphere (2007), 68, 1929
--	---

Active ingredient	
Active ingredient	Myxococcus xanthus microorganism
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	

### Application on stone substrates

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	Immersion
<b>Others (specify)</b>	

NOTES

4.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	Italy

PRODUCT	
<b>Trade name</b>	
<b>Company</b>	University of Granada
<b>Country</b>	Spain
<b>Main property of the product</b>	Consolidant
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	F. Jroundi et al. / Science of the Total Environment 425 (2012) 89–98
---	---

Active ingredient	
<b>Active ingredient</b>	Myxococcus xanthus microorganism
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Nanoparticle concentration	
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Solvent/dispersing medium	
Solvent/dispersing medium	
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	

Application method	
Application method	Immersion
Others (specify)	

NOTES

5.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Portsmouth University
Country	United Kingdom
Main property of the product	Consolidant
Others (specify)	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Technical/Scientific published reference</b>	Zamarreno, Inkpen, May. Applied and Environmental Microbiology (2009), 75, 5981
---	---

Active ingredient	
<b>Active ingredient</b>	Bacterial carbonate precipitant
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Aqueous solution
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	
<b>Others (specify)</b>	

NOTES



## 5.2 Protective coatings

### 5.2.1 Alkoxy-silane and oligomers

1.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	University of Florence
Country	Italy
Main property of the product	Antifouling-Antibacteria
Others (specify)	

Technical/Scientific published reference	F. Bellissima et. al.; Environ Sci Pollut Res (2014) 21:13278–13286;
--	--

Active ingredient	
Active ingredient	TEOS Modified Silver Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	Ag
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	2-propanol/water 4/1
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	





Horizon 2020



**Application on stone substrates**

<b>Stone substrate</b>	
<b>Others (specify)</b>	Serena Stone

**Application method**

<b>Application method</b>	
<b>Others (specify)</b>	Dropping

**NOTES**

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2.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	Italy

**PRODUCT**

<b>Trade name</b>	
<b>Company</b>	University of Bari
<b>Country</b>	Italy
<b>Main property of the product</b>	Antifouling-Antibacteria
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	N.Ditaranto; S. Loperfido; I. van der Werf; A. Mangone; N. Cioffi; L. Sabbatini; Anal Bioanal Chem (2011) 399:473–481
---	---

**Active ingredient**

<b>Active ingredient</b>	TEOS/Nanoparticles
<b>Concentration</b>	

**Nanoparticles**

<b>Nanoparticles</b>	
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Horizon 2020



<b>Others (specify)</b>	Cu
<b>Nanoparticle concentration</b>	0,02-0,28% w

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	White spirit D40
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	
<b>Others (specify)</b>	

NOTES	

3.

COMPILER	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

PRODUCT	
<b>Trade name</b>	
<b>Company</b>	Università del Salento
<b>Country</b>	Italy
<b>Main property of the product</b>	Protective/water repellent

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Others (specify)

Technical/Scientific published reference: Esposito Corcione, Striani, Frigione. Polymer Composites (2015), 36, (6), 1039

Table with 2 columns: Active ingredient, Concentration. Active ingredient: Trimethylolpropane trimethacrylate, Trimethoxypropyl silane methacrylate, Vinyl-terminated polydimethylsiloxane, TEOS and 3-mercaptopropyltriethoxysilane.

Table with 2 columns: Nanoparticles, Others (specify), Nanoparticle concentration.

Table with 2 columns: Solvent/dispersing medium, Specify solvent, Others (specify). Solvent/dispersing medium: NO

Table with 2 columns: Additives, Others (specify). Others (specify): Photo-initiator

Table with 2 columns: Application on stone substrates, Stone substrate, Others (specify). Stone substrate: Limestone

Table with 2 columns: Application method, Others (specify). Application method: Brush



Horizon 2020



#### NOTES

Photopolymerizable organic inorganic formulation

4.

#### COMPILER

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

#### PRODUCT

<b>Trade name</b>	
<b>Company</b>	Lab of Mechanics and Materials Aristotle University of Thessaloniki
<b>Country</b>	Greece
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Karapanagiotis et al. Materials Letters (2014), 131, 276
---	--

#### Active ingredient

<b>Active ingredient</b>	Methyl-trimethoxy-silane
<b>Concentration</b>	

#### Nanoparticles

<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

#### Solvent/dispersing medium

<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	Methanol
<b>Others (specify)</b>	



Horizon 2020



Additives	
Additives	Catalyst
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	Glass, Paper

Application method	
Application method	Brush
Others (specify)	

NOTES

5.

COMPILER	
Partner name	CHEM SPEC
Country	ITALY

PRODUCT	
Trade name	P F A IPA
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	Antifouling, Antibacteria

Technical/Scientific published reference	
--	--

Active ingredient	
Active ingredient	Alkyl-alcoxy-silane oligomers/Nanoparticles
Concentration	40% polymer



Horizon 2020



Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	Ag
Nanoparticle concentration	0,01-0,5 %

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	
Others (specify)	

Additives	
Additives	Catalyst
Others (specify)	

Application on stone substrates	
Stone substrate	Sandstone
Others (specify)	Limestone, Marble, Marble, Granite, Terracotta

Application method	
Application method	Brush
Others (specify)	Spray, Immersion

NOTES

6.

COMPILER	
Partner Name	CHEM SPEC
Country	ITALY



Horizon 2020



PRODUCT	
Trade name	P F A WATER
Company	CHEM SPEC SRL
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	Antifouling, Antibacteria

Technical/Scientific published reference	
--	--

Active ingredient	
Active ingredient	Alkyl-alkoxy-silane oligomers/Nanoparticles
Concentration	30% polymer

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	SiO <sub>2</sub> - Ag
Nanoparticle concentration	0,01 - 5%

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

Application on stone substrates	
Stone substrate	Sandstone
Others (specify)	Limestone, Marble, Granite, Terracotta

Application method	
Application method	Spray
Others (specify)	Immersion



Horizon 2020



**NOTES**

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7.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	
<b>Company</b>	
<b>Country</b>	Spain
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	Ag-TiO <sub>2</sub> -SiO <sub>2</sub>

<b>Technical/Scientific published reference</b>	Pinho, Rojas, Mosquera. Applied Catalysis B: Environmental (2014), 178, 144
---	---

**Active ingredient**

<b>Active ingredient</b>	Colloidal dispersion of TiO <sub>2</sub> and Ag nanoparticles included in a sol of silica oligomers (ethoxysilane)
<b>Concentration</b>	

**Nanoparticles**

<b>Nanoparticles</b>	TiO <sub>2</sub>
<b>Others (specify)</b>	Ag
<b>Nanoparticle concentration</b>	TiO <sub>2</sub> 1-4%(w/v), Ag 1-5-10%(w/v)

**Solvent/dispersing medium**

<b>Solvent/dispersing medium</b>	Organic medium dispersion
<b>Specify solvent</b>	Ethoxysilane
<b>Others (specify)</b>	

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Horizon 2020



Additives	
Additives	Surfactant
Others (specify)	n-octylamine

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	

Application method	
Application method	Spray
Others (specify)	Spray until refusal

NOTES
Prevents cracking, decontaminating

## 5.2.2 Alkyl-aryl-polysiloxanes

1.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	University of Milan
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	



Horizon 2020



<b>Technical/Scientific published reference</b>	G. Cappelletti, P. Fermo, M. Camiloni; Progress in Organic Coatings 78 (2015) 511–516
---	---

Active ingredient	
<b>Active ingredient</b>	Nanoparticles modified polysiloxane
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	TiO <sub>2</sub>
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	30-50-70% in respect of polysiloxane

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	Catalyst
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Marble
<b>Others (specify)</b>	and Angera stone

Application method	
<b>Application method</b>	Spray
<b>Others (specify)</b>	

NOTES	



Horizon 2020



2.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Thessaloniki
Country	Greece
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	Chatzigrigoriou, Manoudis, Karapanagiotis. Macromol. Symp. (2013), 331-332, 158
--	---

Active ingredient	
Active ingredient	Silica nano-particles in aqueous solutions of silanes and siloxanes
Concentration	

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	



Horizon 2020



Application on stone substrates	
Stone substrate	Marble
Others (specify)	Sandstone, Mortar, Wood, Cotton and Ceramic

Application method	
Application method	Brush
Others (specify)	

NOTES
In the present study two improvements are achieved in the aforementioned method. First, a water-based siloxane product is used, replacing thus the harmful organic solvent (white spirit) with water. To the best of our knowledge, waterborne products with water repellent properties, obtained after application/solidification, have not previously reported. Second, siloxane-nano-particle composites are deposited by brush. Therefore, the spraying technique, suggested in our previous works is replaced by an extremely simple deposition procedure.

3.

COMPILER	
Partner name	COLOROBRIA
Country	ITALY

PRODUCT	
Trade name	HP_15_02
Company	Colorobbia Consulting s.r.l.
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	
--	--

Active ingredient	
Active ingredient	Poly dimethyl hydroxy siloxane hydroxy-terminated/Nanoparticles



Horizon 2020



Concentration	
---------------	--

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	0,3% w/w

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Isopropanol
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	

Application method	
Application method	Brush
Others (specify)	

NOTES	

4.

COMPILER	
Partner name	INSTM
Country	ITALY



Horizon 2020



PRODUCT	
Trade name	
Company	
Country	
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	Kapridaki, Pinho, Mosquera, Maravelaki-Kalaitzaki. Applied Catalysis B: Environmental (2014), 156-157, 416
--	--

Active ingredient	
Active ingredient	TiO <sub>2</sub> -SiO <sub>2</sub> -PDMS nanocomposite
Concentration	

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic medium dispersion
Specify solvent	Ethanol (EtOH, SigmaAldrich), isopropanol (ISP, Merck), deionized water
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	

### Application method



Horizon 2020



Application method	Brush
Others (specify)	

NOTES

5.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	Aristotle University of Thessaloniki/Ormylia Foundatio
Country	Greece
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	P.N. Manoudis, I. Karapanagiotis, A. Tsakalof, I. Zuburtikudis, B. Kolinkeová, C. Panayiotou, Appl Phys A (2009) 97: 351–360
--	--

Active ingredient	
Active ingredient	Particles modified Poly alkylsiloxane
Concentration	

Nanoparticles	
Nanoparticles	SiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	2% w/v



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	White spirit
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Sandstone
Others (specify)	

Application method	
Application method	Spray
Others (specify)	

NOTES
Two commercially available poly (alkyl siloxane) products in white spirit, Rhodorsil 224 (Rhodia Silicones) 7% wt and Porosil VV plus (AquaBarta) 10% wt, were used as received. Silica (SiO <sub>2</sub> ) particles (fumed powder, Aldrich) with a 7 nm mean diameter were dispersed (2.0% w/v) in the siloxane solutions.

### 5.2.3 Acrylics

1.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Politecnico di Torino
Country	Italy
Main property of the product	Protective/water repellent

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage





Horizon 2020



Others (specify)	
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Technical/Scientific published reference	Serra, Tulliani, Sangermano. Macromol. Mater. Eng. (2014), 299, 1352
--	--

Active ingredient	
Active ingredient	Acrylic copolymer
Concentration	20%

Nanoparticles	
Nanoparticles	ZnO
Others (specify)	
Nanoparticle concentration	0,4 % w

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	
Others (specify)	

Additives	
Additives	Surfactant
Others (specify)	

Application on stone substrates	
Stone substrate	
Others (specify)	

Application method	
Application method	
Others (specify)	

NOTES	



Horizon 2020



2.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Aristotle University of Thessaloniki
Country	Greece
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	Spathis, Karagiannidou, Magoula. Studies In Conservation (2003), 48, 57
--	---

Active ingredient	
Active ingredient	Particles modified Paraloid B72
Concentration	

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	5-30% in w in respect of Paraloid solids

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Acetone
Others (specify)	

Additives	
Additives	
Others (specify)	



Horizon 2020



**Application on stone substrates**

<b>Stone substrate</b>	
<b>Others (specify)</b>	

**Application method**

<b>Application method</b>	
<b>Others (specify)</b>	

**NOTES**

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Fluorinated or partially fluorinated polymers

1.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	
<b>Company</b>	Jiangsu University
<b>Country</b>	China
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Li, Qiu, Zhang, Wang, Chen, Yang. Journal of Polymer Engineering (2015), 35, (6), 511
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**Active ingredient**

<b>Active ingredient</b>	Dodecafluoroheptyl methacrylate-siloxane
<b>Concentration</b>	30%; 10%

**Nanoparticles**

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	
<b>Specify solvent</b>	
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	
<b>Others (specify)</b>	

<b>Application method</b>	
<b>Application method</b>	
<b>Others (specify)</b>	

<b>NOTES</b>

2.

<b>COMPILER</b>	
<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

<b>PRODUCT</b>	
<b>Trade name</b>	



Horizon 2020



<b>Company</b>	Institute for Conservation and Valorization of Cultural Heritage/University of Florence
<b>Country</b>	Italy
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Sacchi, Giannini, Frediani, Rosi, Frediani. J. Coat. Technol. Res. (2013), 10 (5), 649
---	--

Active ingredient	
<b>Active ingredient</b>	
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	
<b>Others (specify)</b>	



Horizon 2020



**NOTES**

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3.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	
<b>Company</b>	Zhejiang University
<b>Country</b>	China
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Zhang, Liu, Liu, Zhang. Progress in Organic Coatings (2013), 76, 1127
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**Active ingredient**

<b>Active ingredient</b>	Methyl potassium silicate (aqueous solution), Fluororubber, Hexadecyltrimethoxysilane
<b>Concentration</b>	

**Nanoparticles**

<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

**Solvent/dispersing medium**

<b>Solvent/dispersing medium</b>	Organic solvent
<b>Specify solvent</b>	Butyl acetate
<b>Others (specify)</b>	Water

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	
Others (specify)	Sandstone, Tuff, Dolomite, Granite, Marble

Application method	
Application method	Immersion
Others (specify)	

NOTES

## 5.2.4 Oxalates

1.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Università di Perugia
Country	Italy/Portugal
Main property of the product	Consolidant
Others (specify)	protective



Horizon 2020



<b>Technical/Scientific published reference</b>	Doherty, Pamplona, Miliani et al. J.Cultural Heritage (2007), 8, 186
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Active ingredient	
<b>Active ingredient</b>	Calcium oxalate
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	Immersion
<b>Others (specify)</b>	

NOTES
Monitoring of long term efficacy

2.

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage





Horizon 2020



COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	University of Münster/Utrecht University/University of Bonn
Country	Germany/The Netherlands
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	King et al. Cryst. Growth Des. (2014), 14, 3910
--	---

Active ingredient	
Active ingredient	Oxalic acid
Concentration	1-1000 mM

Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage

Grant Agreement no: 646178

161/173



Horizon 2020



Application method	
Application method	Immersion
Others (specify)	

NOTES

3.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Opificio delle Pietre Dure/Istituto per la Conservazione e la Valorizzazione dei Beni Culturali
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	Pinna, Salvadori, Porcinai. Construction and Building Materials (2011), 25, 2723
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Active ingredient	
Active ingredient	Ammonium oxalate
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	
Nanoparticle concentration	

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous solution
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	Gioia Marble

Application method	
Application method	Poultice
Others (specify)	

NOTES
<p>Aim of the research was to select the best application conditions of the two products on salt-laden stone specimens, investigating as well the dependence of the protective action on the procedures adopted to apply the products. The performance of different concentrations and contact times of the products was tested in the laboratory, paying special attention to the possible drawbacks due to the salt.</p>

## 5.2.5 Low molecular weight inorganics

1.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT
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NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Trade name</b>	
<b>Company</b>	University of Parma; University of Catania
<b>Country</b>	Italy
<b>Main property of the product</b>	Antifouling-Antibacteria
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	L. Bergamonti et al.; Applied Surface Science 282 (2013) 165–173
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<b>Active ingredient</b>	
<b>Active ingredient</b>	Nanoparticles
<b>Concentration</b>	

<b>Nanoparticles</b>	
<b>Nanoparticles</b>	TiO <sub>2</sub>
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	

<b>Solvent/dispersing medium</b>	
<b>Solvent/dispersing medium</b>	Aqueous dispersion
<b>Specify solvent</b>	
<b>Others (specify)</b>	

<b>Additives</b>	
<b>Additives</b>	
<b>Others (specify)</b>	

<b>Application on stone substrates</b>	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

<b>Application method</b>	
<b>Application method</b>	Brush
<b>Others (specify)</b>	



Horizon 2020



**NOTES**

The sol-gel synthesis of TiO<sub>2</sub> anatase nanosol obtained by a low temperature method and its application to stone samples to evaluate the de-soiling properties and the harmless nature of the coating. The tests have been performed also after a pre-treatment with SiO<sub>2</sub> of the stone surface.

2.

**COMPILER**

<b>Partner name</b>	INSTM
<b>Country</b>	ITALY

**PRODUCT**

<b>Trade name</b>	
<b>Company</b>	University of Parma & IMEM-CNR Lecce
<b>Country</b>	Italy
<b>Main property of the product</b>	Protective/water repellent
<b>Others (specify)</b>	

<b>Technical/Scientific published reference</b>	Bergamonti et al., Environ. Sci. Pollut. Res. (2014), 21, 13264
---	---

**Active ingredient**

<b>Active ingredient</b>	Nanoparticles
<b>Concentration</b>	

**Nanoparticles**

<b>Nanoparticles</b>	TiO <sub>2</sub>
<b>Others (specify)</b>	Au
<b>Nanoparticle concentration</b>	

**Solvent/dispersing medium**

<b>Solvent/dispersing medium</b>	Aqueous dispersion
<b>Specify solvent</b>	
<b>Others (specify)</b>	



Horizon 2020



Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Marble
Others (specify)	Limestone

Application method	
Application method	Brush
Others (specify)	

NOTES

3.

COMPILER	
Partner name	INSTM
Country	Italy

PRODUCT	
Trade name	
Company	University of Bologna / Leonardo S.r.l.
Country	Italy
Main property of the product	Protective
Others (specify)	Self-cleaning

Technical/Scientific published reference	E. Franzoni et al. / Building and Environment 80 (2014) 125e135
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Active ingredient	
Active ingredient	Nanoparticles of titanium dioxide in the anatase form 0.1% by weight of NaOH

NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



Concentration	3.4 wt%
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Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	3.4 wt%

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	Water
Others (specify)	

Additives	
Additives	
Others (specify)	0.1% by weight of NaOH

Application on stone substrates	
Stone substrate	
Others (specify)	Plaster

Application method	
Application method	Brush
Others (specify)	

NOTES	

4.

COMPILER	
Partner name	INSTM
Country	ITALY



Horizon 2020



PRODUCT	
Trade name	
Company	Polytechnic University of Marche, Ancona
Country	Italy
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	Goffredo, Quagliarini, Bondioli, Munafo. J. Nanoengin. Nanosyst.(2014), 228, 2
--	--

Active ingredient	
Active ingredient	Nanoparticles
Concentration	

Nanoparticles	
Nanoparticles	TiO <sub>2</sub>
Others (specify)	
Nanoparticle concentration	1 wt%

Solvent/dispersing medium	
Solvent/dispersing medium	Aqueous dispersion
Specify solvent	
Others (specify)	

Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	
Others (specify)	Limestone

Application method	
Application method	Spray
Others (specify)	





Horizon 2020



#### NOTES

5.

#### COMPILER

<b>Partner Name</b>	INSTM
<b>Country</b>	Italy

#### PRODUCT

<b>Trade name</b>	
<b>Company</b>	University of Campeche
<b>Country</b>	Mexico
<b>Main property of the product</b>	Protective
<b>Others (specify)</b>	Antifungal

<b>Technical/Scientific published reference</b>	Gomez-Ortíz et al. ACS Appl. Mater. Interfaces 2013, 5, 1556–1565
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#### Active ingredient

<b>Active ingredient</b>	Inorganic nanoparticles
<b>Concentration</b>	

#### Nanoparticles

<b>Nanoparticles</b>	ZnO
<b>Others (specify)</b>	Ca(OH) <sub>2</sub> and TiO <sub>2</sub>
<b>Nanoparticle concentration</b>	Ca(OH) <sub>2</sub> 0,27 M

#### Solvent/dispersing medium

<b>Solvent/dispersing medium</b>	Organic medium dispersion
<b>Specify solvent</b>	Ethanol
<b>Others (specify)</b>	



Horizon 2020



Additives	
Additives	
Others (specify)	

Application on stone substrates	
Stone substrate	Limestone
Others (specify)	

Application method	
Application method	Immersion
Others (specify)	

NOTES

6.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	
Country	
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	Licciulli, A., Calia, A., Lettieri, M., Diso, D., Masieri, M., Franza, S., Casarano, G. (2011). Photocatalytic TiO <sub>2</sub> coatings on limestone. <i>Journal of Sol-Gel Science and Technology</i> , 60(3), 437–444.
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Active ingredient
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NMP-21-2014: Materials-based solutions for protection or preservation of European cultural heritage



Horizon 2020



<b>Active ingredient</b>	Titania nanoparticle dispersion
<b>Concentration</b>	

Nanoparticles	
<b>Nanoparticles</b>	TiO <sub>2</sub>
<b>Others (specify)</b>	
<b>Nanoparticle concentration</b>	1 wt%.

Solvent/dispersing medium	
<b>Solvent/dispersing medium</b>	Aqueous dispersion
<b>Specify solvent</b>	
<b>Others (specify)</b>	

Additives	
<b>Additives</b>	
<b>Others (specify)</b>	

Application on stone substrates	
<b>Stone substrate</b>	Limestone
<b>Others (specify)</b>	

Application method	
<b>Application method</b>	Spray
<b>Others (specify)</b>	

NOTES



Horizon 2020



## 5.2.6 Aliphatic polyester

1.

COMPILER	
Partner name	INSTM
Country	ITALY

PRODUCT	
Trade name	
Company	Izmir Institute of Technology
Country	Turkey
Main property of the product	Protective/water repellent
Others (specify)	

Technical/Scientific published reference	Ocak, Sofuoglu, Tihminlioglu, Böke. Journal of Cultural Heritage (2015), 16, 299
--	--

Active ingredient	
Active ingredient	Organoclay/poly(lactic acid) nanocomposite
Concentration	

Nanoparticles	
Nanoparticles	
Others (specify)	Organoclay nanoparticles (montmorillonite)
Nanoparticle concentration	

Solvent/dispersing medium	
Solvent/dispersing medium	Organic solvent
Specify solvent	Chloroform
Others (specify)	

Additives	
Additives	
Others (specify)	



Horizon 2020



**Application on stone substrates**

<b>Stone substrate</b>	Marble
<b>Others (specify)</b>	

**Application method**

<b>Application method</b>	Immersion
<b>Others (specify)</b>	Dip coatings

**NOTES**

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