



Horizon 2020



D7.4 – Workshop at Cologne Cathedral

Project Information

Grant Agreement Number	646178
Project Full Title	Nanomaterials for conservation of European architectural heritage developed by research on characteristic lithotypes
Project Acronym	NANO-CATHEDRAL
Funding scheme	NMP-21-2014 Materials-based solutions for protection or preservation of European cultural heritage
Start date of the project	June 1, 2015
Duration	36 months
Project Coordinator	Andrea Lazzeri (INSTM)
Project Website	www.nanocathedral.eu

Deliverable Information

Deliverable n°	7.4
Deliverable title	Workshop at Cologne Cathedral
WP no.	7
WP Leader	WIED
Contributing Partners	
Nature	Websites, patents filling, etc.
Authors	Ulrike Brinkmann, Tanja Pinkale
Contributors	
Reviewers	Adelheid Wiedemann (WIED), Lisa Bregoli (WG)
Contractual Deadline	March 31, 2018
Delivery date to EC	April 6, 2018

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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1 INTRODUCTION

Target of the workshop was to pass comprehensive information about aims and results of the Nano-Cathedral project to the professional public. The newly developed materials were chemically introduced, test methods were demonstrated, methods for selecting and preparing stone surfaces were explained, handling and application of the nano products at the different sites were described. Besides, walkabouts on site and in the conservation studio offered the opportunity to inspect trial areas, to scrutinize surface preparation and to make own experiences with the product performance of Nano-Cathedral-protectives. The workshop ended in an open discussion about input and outcome of the project and about gain and risks of the newly formulated materials.

2 GENERAL INFORMATION

2.1 Title

New nano materials for consolidation and protection of selected lithotypes –Workshop at Cologne Cathedral's Works Department

2.2 Date

March 15, 2018

2.3 Location

Conference room and stone conservation studio of Cologne Cathedral Works Department (Roncalliplatz 2, D-50667 Köln)

2.4 Organizers and Contributors

Organizers: The Nano-Cathedral team and additional employees of HDK

Contributors:

Members of the Nano-Cathedral consortium:

Ulrike Brinkmann, Sven Eversberg, Tanja Pinkale, Jasper Völkert, Mira Wurth (HDK); Lucia Toniolo (POLIMI); Elisabeth Mascha (ITACS); Pablo Garcia Lumbreras (FCSM)

External speaker:

Niklas Underwood; M.A., Cologne Institute of Conservation Sciences, Department Stone and Murals

Further attendees of the Nano-Cathedral consortium:

Adelheid Wiedemann (WIED), Zoltán Juhász, Alexandra Schmölder (UBAM); Ignace Roelens (ARCHI)

2.5 Language

Generally: German

Presentations of Lucia Toniolo and Pablo Garcia Lumbreras: English

Questions and answers concerning their presentations were translated.



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2.6 Translation service foreseen (yes/no)

No

2.7 Target Audience

Stone conservators, architects, authorities for the protection of historic buildings and monuments:

1. stonemasons
2. working as traditional craftsmen
 - a. trained as “certified restorers in stonemason’s craft”
 - b. teachers for instruction of stonemasons in manual/technical restoration techniques (Academy of Crafts, Schloss Raesfeld)
3. Cathedral Architects, site managers and local authorities for heritage conservation and representatives of departments for cultural heritage in Germany (North Rhine-Westphalia, Hesse, Bavaria)
4. professors and university teachers for conservation and restoration
5. students of stone conservation and restoration
6. freelance and employed conservators and restorers

On purpose, commercial producers of stone conservation materials were not invited, due to justified fears that they might dominate or even impede an open discussion.

2.8 Foreseen number of people

65-70

2.9 Actual number of participating people

55

Due to a raging wave of influenza in Germany some registrations were cancelled. On the other hand, several local colleagues spontaneously took part in the workshop (partly not inscribed in the participant list).

Additionally, a press team from the department of Social Media Management of the Archdiocese of Cologne was present.



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Workshop in der Dombauhütte Köln am 12. März 2018

Teilnehmerliste

Name	Unterschrift
Abraham, Sabine	
Becker, Yasemin	
Braune, Daniel	
Brinkmann, Susanne	
Brinkmann, Ulrike	
Davepon, Udo	
Diedrichsen, Thomas	
Distelrath, Albert	
Endemann, Sebastian	
Eversberg, Sven	
Finsterbusch, Britta	
Fischer, Manfred	
Füsstenich, Peter	
Garcia, Pablo	
Gleßner, Stefan	
Heinen, Sigrun	
Hilbert, Georg	
Hollemann, Matthias	
Juhasz, Zoltan	
Kozub, Peter	
Kozub, Beate	
Krauthäuser, Dietmar	
Lucas, Stefan	
Mascha, Elisabeth	
Mertens, Lea	



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Nano-Cathedral

Nano-Cathedral

Mittelfarwick, Elena



Müller, Hubertus



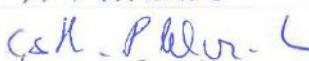
Piek, Bruno



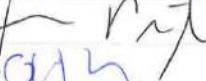
Pinkale, Tanja



von Plehwe-Leisen,
Esther



Prigl, Jürgen



Pung, Olaf



Riecke, Uta



Roelens, Ignace



Rüße, Markus



Sabatzki, Christoph



Schaab, Christoph



Schmölder, Alexandra



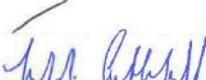
Schubert, Johannes



~~Schulz, Markus~~



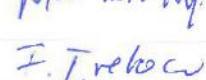
~~Streuff, Michael~~



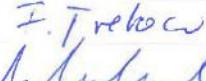
Sutthoff, Ludger J.



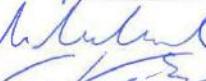
Toniolo, Lucia



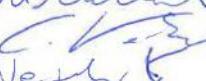
Tretow, Franziska



Underwood, Niklas



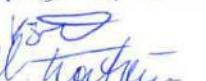
Verbeek, Christina



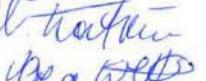
Veselinovic, Predrag



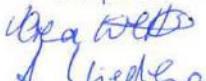
Völkert, Jasper



Watrin, Nina



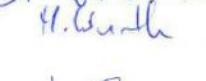
Wetter, Verena



Wiedemann, Adelheid



Wurth, Mira



LYKO, Anna-Maria 



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2.10 How were participant invited?

As only specialists were foreseen, invitations were sent to official or private e-mail addresses. An introducing letter of invitation gave brief information, an attached flyer informed about title and content of the EU-Project, date, time and location of the workshop, speakers, contact data etc. (Fig. 2).

Additionally, the inviting flyer were displayed at the Technical University of Cologne and the Academy for Crafts in Raesfeld in order to inform the related students. The workshop event was also made public by personal conversations with colleagues and fellow students.

From the beginning, the number of participants was foreseen to be limited. The underlying consideration was that a too large an audience would have been a serious impediment for an open discussion. Furthermore, the walkabouts to areas on site and in the stone conservation studio would have been impossible to perform.

Letter of Invitation:

Sehr geehrte Damen und Herren,
liebe Kolleginnen und Kollegen,

die Dombauhütte Köln ist seit Mai 2015 in ein Forschungsprojekt zur Steinkonservierung eingebunden, in dessen Rahmen neu entwickelte Nanomaterialien zur Konservierung ausgewählter Gesteinsvarietäten erprobt werden. Am Kölner Dom betrifft das vor allem den Schlaitdorfer und den Obernkirchener Sandstein.

Wir werden am

Donnerstag, 15. März 2018

einen Workshop veranstalten, in dem wir ausführlich über das Projekt informieren und mit Fachkollegen diskutieren wollen. Dazu möchten wir Sie herzlich einladen! Das vorläufige Programm finden Sie im Anhang! Für Essen und Trinken wird gesorgt.

Über Ihre Teilnahme würden wir uns sehr freuen. Hierzu melden Sie sich bitte bis zum 10. März 2018 an bei mira.wurth@dombau-koeln.de.

Bitte reichen Sie unsere Einladung an interessierte Kollegen weiter! Allgemeine Informationen zu dem Forschungsprojekt finden Sie unter www.nanocathedral.eu

In der Hoffnung auf Ihr Interesse grüßt Sie, auch im Namen von Dombaumeister Füssenich, das Steinrestaurierungsteam der Kölner Dombauhütte:

Sven Eversberg, Tanja Pinkale, Jasper Völkert und Mira Wurth



Metropolitankapitel der Hohen Domkirche Köln
Dombauhütte - Steinrestaurierungswerkstatt

MITTIG GESETZTE VERSION MIT VOLLER UNTERSCHRIFT!!!

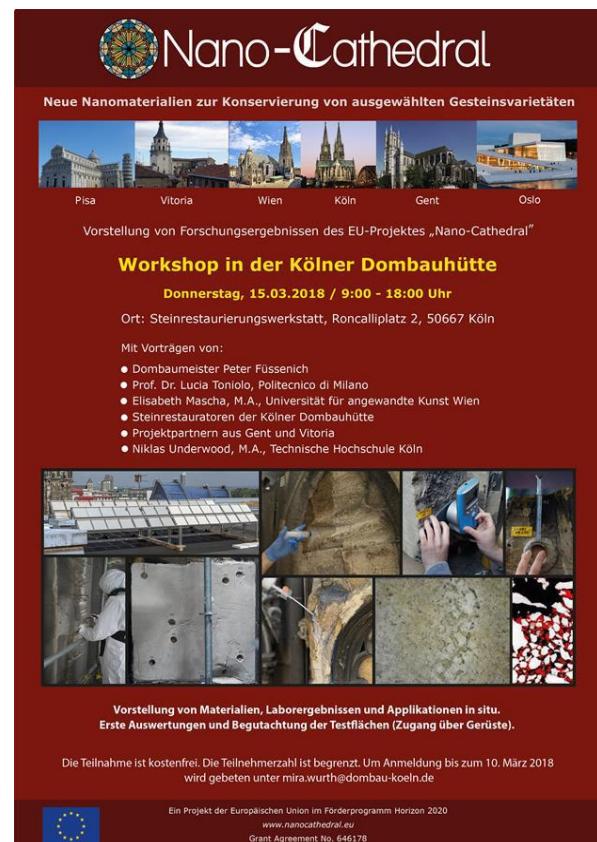


Fig. 1: Inviting letter (in German)

Fig. 2: Inviting flyer (German version)



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Nano-Cathedral

Newly developed nanomaterials for the conservation of selected lithotypes



Pisa

Vitoria

Vienna

Cologne

Ghent

Oslo

Presentation of research results of the EU-Project „Nano-Cathedral“

Workshop at the Works Department of Cologne Cathedral

Thursday, 15.03.2018 / 9:00 – 18:00

Location: Stone Conservation Workshop, Roncalliplatz 2, 50667 Cologne

Lectures by:

- Cathedral Architect Peter Füssenich
- Prof. Dr. Lucia Toniolo, Politecnico di Milano
- Elisabeth Mascha, University of applied arts Vienna
- Stone conservators of the works department of Cologne Cathedral
- Project partners from Gent and Vitoria
- Niklas Underwood, Technical University Cologne



**Presentation of materials, laboratory results and applications in situ.
First validations and visual assessment of the trial areas (access from scaffolds)**

Participation is free. The number of participants is limited. Please register until 1st of March 2018
at mira.wuth@dombau-koeln.de



A project of the European Union within the funding program Horizon 2020
www.nanocathedral.eu
Grant Agreement No. 646178

Fig. 3: Inviting flyer (English version)



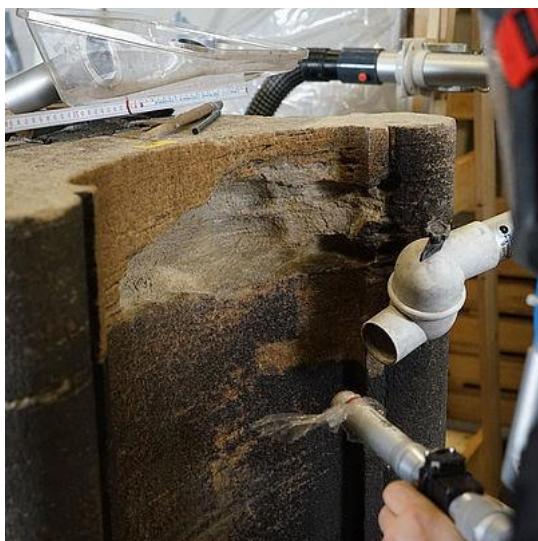
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2.11 Used communication tools for workshop visibility/publicity

- Press release

A press release was sent to local newspapers and relevant other media. It was also launched at the “newsroom” of Cologne Cathedral: <https://www.koelner-dom.de/medien/newsroom/newsroom-detaileseite> (see text below).



Neue Materialien zur Steinkonservierung

Bild: Oberflächenreinigung durch Lasertechnik an einem Trommelstück aus Schlaitdorfer Sandstein.

Workshop zum EU-Projekt „Nano-Cathedral“ in der Kölner Dombauhütte am 15. März 2018

Am 15. März 2018 fand in der Kölner Dombauhütte ein Workshop zu neuen Materialien für die Steinkonservierung statt. Bei der Veranstaltung wurden die bisherigen Ergebnisse des EU-Forschungsprojektes "Nano-Cathedral" mit Fachleuten diskutiert. Eingeladen waren Dombauhütten, Restauratoren, Architekten, Denkmalpfleger, Dozenten und Studenten der Steinrestaurierung sowie Fachfirmen für Erhaltung von Natursteinen.

Die Kölner Dombauhütte ist seit 2015 an diesem Forschungsprojekt beteiligt, das dem Erhalt von europäischen Architekturerbestätten dienen soll. Finanziert wird das dreijährige Projekt "Nano-Cathedral", das im kommenden Mai endet, aus Mitteln der Europäischen Union. Insgesamt 19 Partner aus sechs europäischen Ländern sind unter der Leitung von Prof. Andrea Lazzeri von der Universität Pisa an den Forschungsarbeiten beteiligt, darunter universitäre Forschungsinstitute und -labore sowie Firmen der chemischen Industrie.

Ziel des Forschungsprojektes ist es maßgeschneiderte, innovative Lösungen für die Konservierung von Naturstein zu entwickeln. Neben dem Kölner Dom stehen der Stephansdom in Wien, der Dom zu Pisa, die Kathedrale St. Bavo in Gent, die Kathedrale in Vitoria-Gasteiz sowie das Opernhaus in Oslo im Mittelpunkt der Forschungsarbeiten. Für die Auswahl der Bauten waren nicht nur die dort verwendeten repräsentativen Gesteinssorten wie Marmor, Sandstein und Kalkstein ausschlaggebend, sondern auch die unterschiedlichen Klimazonen.

Für die verschiedenen Gesteine wurden nach gründlicher Untersuchung der jeweiligen Verwitterungsprobleme neuartige, nano-skalierte Materialien zur Konsolidierung und zum Oberflächenschutz entwickelt. Die Wirksamkeit dieser Mittel wird derzeit an den verschiedenen Bauten erprobt. Die Tests am Kölner Dom betreffen zum einen den Schlaitdorfer Sandstein, dessen Erhaltungszustand besondere Sorgen bereitet, zum anderen den Oberkirchener Sandstein, der zwar deutlich stabiler ist, dessen Oberflächen aber schutzbedürftig sind. An ausgewählten Flächen wurden schadensspezifisch angepasste Nano-Materialien aufgetragen, deren Eignung langfristig unter Beobachtung und Kontrolle stehen wird.



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Zur Bedeutung des Forschungsprojektes für den Kölner Dom sagt Dombaumeister Peter Füssenich: "Tradition und moderne Technologie widersprechen sich keineswegs. Im Mittelalter waren gerade die Dombauhütten Innovationsbetriebe, in denen modernste Techniken eingesetzt und weiterentwickelt wurden. Auch heute müssen wir neben unserer handwerklichen Tradition innovative Verfahren einsetzen, um den Erhalt unserer Dome und Kirchen bestmöglich zu bewerkstelligen".

Information zum Forschungsprojekt "Nano-Cathedral" unter www.nanocathedral.eu

U. Brinkmann/M. Deml

- **Two Video films**

In accordance between Cologne Cathedral's works department and the Department for Social Media Management of the Archdiocese of Cologne, the workshop was documented in a video clip of about 2.5 minutes length. Included were interviews with Lucia Toniolo (POLOMI) and Elisabeth Mascha (ITACS). Both were asked about their work in the project and the added value and prospects of the newly developed products. Elisabeth Mascha, trained stone conservator, was further asked to explain the role of the conservators within this project of research. The video will be launched on the Website of Cologne Cathedral and will also linked on Facebook.

Additionally, a longer video film of 8-10 minutes length was produced, documenting the conservator's work at Cologne Cathedral in the context of the Nano-Cathedral project, exemplified by pursuing measurements and test treatments. The video is to give an impression of the conservators' tasks within the project, focused on application and validation. The documentation is foreseen to be presented in the one or the other way at the final conference in Pisa.

3 DESCRIPTION OF WORKSHOP

3.1 Objectives and description of the event

Target of the workshop was to inform the expert audience extensively about aims and results of the Nano-Cathedral project. The newly developed materials were chemically introduced, test methods were demonstrated, selecting and preparing of stone surfaces were explained, handling and application of the nano products at the different sites were described, input and outcome, gain and risks in the use of nano materials were discussed. Five out of seven lectures were focussed on Nano-Cathedral (see program). After each lesson sufficient time was given for questions and answers. Coffee breaks and lunch contributed to a personal exchange between the participants. The workshop session ended with an open and vivid discussion about inputs and outcome of the project as well as gain and risks of the newly formulated materials.

3.2 Practical lessons on site

Embedded in the sequence of lectures, a practical session was substantial part of the workshop. All participants got a guided tour to the trial areas for inspecting surface treatment performances on site. In the conservation studio "stations" were prepared, giving chance to perform drop-tests on stone slabs treated with NC-protectives, to inspect by eye and by microscope reacted NC-material



poured in petri dishes, to touch different blasting media and to scrutinize chemical cleaned surfaces. Additionally, measurement tools for the validation were exposed and explained.

3.3 Assessment of results

Generally, there was a substantial interest in the Nano-Cathedral-project. Many participants expressed their appreciation for the work being performed. Nevertheless, the evaluation of the newly developed products was rather reluctant, regardless to the fact that a bundle of results are still outstanding. Numerous concise and critical questions were asked, many of them could not (yet) be answered. All in all, none of the developed product was considered to be marketable.

3.4 Results and Expected Impacts

The objective and constructive criticism of the audience could give a positive input on a further development of nano materials for stone conservation in general. With regard to the Nano-Cathedral project, critical questions, ideas, suggestions and doubts concerning the developed products will be passed to the scientists in the NC-consortium and might lead to resume work.

3.5 Modifications from what had been planned in Deliverable D7.5 “Training public plan”

Different as originally foreseen in D 7.5, the practical section was not limited to “10-15 experienced stone conservators” but was open to all participants. As solely experts were invited, all of them should have had the opportunity of making personal experiences and to perform tests of their own.

Also the idea to discuss a draft of the operational guidelines (see D 7.5) was revised. This was due to the fact that the guidelines are still work in progress. Nevertheless, the general prospect of guidelines served as a basis for discussion with the participants. Suggestions, ideas and questions of the audience were collected and will be regarded in the final version.

4 AGENDA

09.00 – 10.15	Welcome	Ulrike Brinkmann
	„Conservation work at Cologne Cathedral“	Peter Füssenich Cathedral Architect
	„EU-Project Nano-Cathedral“	Jasper Völkert
10.15 – 10.30	Coffee-Break	
10.30 – 12.00	„The protection of natural stones in outdoor environment: new perspective to a difficult challenge“	Lucia Toniolo
	Questions and discussion	



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„Festigungsmaßnahmen im Labor: Unterschiede zwischen Nano-Systemen und herkömmlichen Festigern“	Elisabeth Mascha
Questions and discussion	
12.00 – 13.00	<i>Lunch</i>
13.00 – 15.00	„Nano-Cathedral at Cologne Cathedral“ Sven Eversberg
	Tour: Trial areas on site and work samples in the stone conservation studio Sven Eversberg, Tanja Pinkale, Jasper Völkert, Mira Wurth
15.00 – 15.30	<i>Coffee-Break</i>
15.30 – 18.00	„Santa María de Vitoria Cathedral – Nano-Cathedral Project“ Pablo García Lumbreras
	„Non-destructive damage diagnosis by ultrasound“ Niklas Underwood
	Summary and outlook Tanja Pinkale
	Final discussion



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Workshop in der Dombauhütte Köln am 15. März 2018

Programm

09.00 – 10.15	Begrüßung	Ulrike Brinkmann
	„Arbeiten am Kölner Dom“	Dombaumeister Peter Füssenich
	„Das Projekt Nano-Cathedral“	Jasper Völkert
10.15 – 10.30	<i>Kaffeepause</i>	
10.30 – 12.00	„The protection of natural stones in outdoor environment: new perspective to a difficult challenge“	Lucia Toniolo
	Fragen und Diskussion	
	„Festigungsmaßnahmen im Labor: Unterschiede zwischen Nano-Systemen und herkömmlichen Festigern“	Elisabeth Mascha
	Fragen und Diskussion	
12.00 – 13.00	<i>Mittagspause (im Aufenthaltsraum der Dombauhütte)</i>	
13.00 – 15.00	„Nano-Cathedral am Kölner Dom“	Sven Eversberg
	Rundgang: Testflächen am Dom und Arbeitsproben in der Steinrestaurierungswerkstatt	
15.00 – 15.30	<i>Kaffeepause</i>	
15.30 – 18.00	„Santa María de Vitoria Cathedral – Nano-Cathedral Project“	Pablo García Lumbreras
	„Zerstörungsfreie Schadensdiagnose mittels Ultraschall“	Niklas Underwood
	Zusammenfassung und Ausblick	
	Abschlussdiskussion	



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5 LINKED ACTIVITIES

- **Video film**

In cooperation between Cologne Cathedral's works department and the Social Media Management Department of the Archdiocese of Cologne, a video film of 8-10 minutes length was produced, documenting the conservator's work at Cologne Cathedral in the context of the Nano-Cathedral project, exemplified by pursuing measurements and test treatments. The video is to give an impression of the conservators' tasks within the project, focused on application and validation. The documentation is especially foreseen to be presented in the one or the other way at the final conference in Pisa.

- **Surveys performed by UBAM**

Relating to WP6: *Analysis of the socio-economic & cultural impact*, Zoltán Juhász and Alexandra Schmölder (UBAM) distributed – as before at the NC-workshops in Vienna, Ghent and Vitoria – a questionnaire concerning cultural heritage preservation and assessments of nano materials. Obviously, the return flow was good.

Another survey was performed on the day before the workshop took place (March 14, 2018). Zoltán Juhász, Alexandra Schmölder and Tamara Bock (UBAM) talked to stonemasons of Cologne Cathedral's works department, divided in two groups with different works tasks: hewing and sculpting stones in the workshop or shifting and locating stones on site. Among other, both groups were asked about their attitude to new technologies in stone conservation in relation to their traditional centuries-old craft.



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6 Annexes

Impressions (Fig. 4-17)



Fig. 4: Reception



Fig. 5: Reception



Fig. 6: Welcome by Ulrike Brinkmann



Fig. 7: Lecture by Cathedral Architect Peter Füssenich



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Nano-Cathedral



Fig. 8: Lecture by Cathedral Architect Peter Füssenich



Fig. 9: Tour on site (trial areas)



Fig. 10: Tour on site (trial areas)



Fig. 11: Station "Preparation" in the conservation studio



Fig. 12: Station "Preparation" in the conservation studio



Fig. 13: Station "Evaluation" in the conservation studio



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Nano-Cathedral



Fig. 14: Station "Product performance" in the conservation studio



Fig. 15: Station "Product performance" in the conservation studio



Fig. 16: Reception and coffee break room

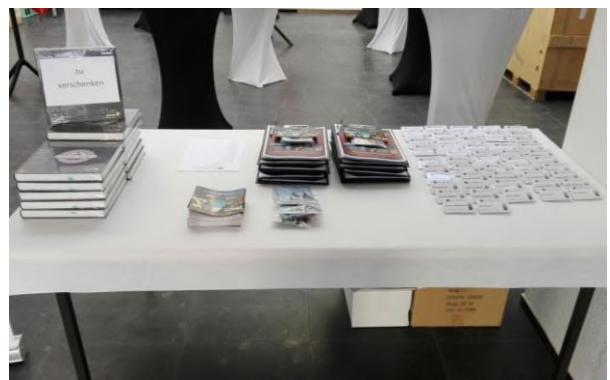


Fig. 17: Reception desk



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Dissemination material (fig. 18, 19)



Fig. 18: Official flyer



Fig. 198: Official Nano-Cathedral Flyer



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Nano-Cathedral



Im Projekt NANO-CATHEDRAL werden neue Materialien und Verfahren zum Erhalt geschädigter Natursteine am Beispiel europäischer Kathedralen und des Opernhauses in Oslo entwickelt.

Ausgewählte Gesteinsvarietäten

- Köln
Oberkirchener Sandstein
- Köln
Schalkfurther Sandstein
- Gent
Belgisch Kalkstein
- Pisa/Oslo
Apuan/Carrara Marmor
- Vitoria
Ajaite Kalkstein
- Wien
St. Magdalenen Kalksandstein

Materialentwicklung

Auf Grundlage der Verwitterungsphänomene an den sechs ausgewählten Gesteinen wurden unterschiedliche Materialien für die Vorversuche ausgewählt

15 Konsolidierungsmittel	20 Steinschutzmittel
Daraus wurden fünf Produkte für weitere Labortests nach folgenden Kriterien ausgewählt:	Daraus wurden sechs Produkte für weitere Labortests nach folgenden Kriterien ausgewählt:
<ul style="list-style-type: none"> Reaktionsfähigkeit der Nanopartikel Kombinierbarkeit von Nanopartikel mit Kiesel säureester (TEOS) Verwendbarkeit von Nano-SiO₂ und Nano-ZrO₂ als Konsolidierungsmittel Stabilisierung von Nanopartikeln 	<ul style="list-style-type: none"> Einsatz von Nano-TiO₂ zur Fotokatalyse Einsatz von Nanosilber gegen biogenen Bewuchs (Antifouling) Funktionalisierung von nanoskalierten Polymeren

Testprogramm

Materialanwendung an natürlich und künstlich gealterten Gesteinsproben im Labor

- Vergleichbarkeit von natürlicher und künstlich induzierter Verwitterung
- Entwicklung geringsspezifischer Parameter zur Steinmetrischen Abteilung
- Erfassende Folgen pro Gesteinsvariante

Materialanwendung in situ

- Auswahl der bestgeeigneten Materialien zur Anwendung an den Kathedralen und dem Opernhaus in Oslo
- Applikation auf Museumsfläche
- Entwicklung von Lösungen zur Anwendung der neuen Nano Produkte

Innovative Forschung

- Neuartige Verfahren zur Konsolidierung, zum Schutz und zur Verminderung von schadstoffinduzierter Verwitterungsprozesse an Gesteinen
- Interdisziplinärer Ansatz zur Entwicklung kosten günstiger Verfahren, die lückenlose Wertschöpfung skizzieren gewährleisten
- Nachhaltigkeit von Anfang an: Lebenszyklus- und Lebenszykluskostenanalyse

Ziele

- Erhaltung der originalen Gesteinsoberflächen
- Entwicklung leichterer Behandlungsverfahren
- Beitrag zu nachhaltiger Konservierung

Auswirkungen

- Kulturell
- Ökonomisch
- Sozial

Projektpartner

Dieses Projekt erhält finanzielle Unterstützung durch die Europäische Union aus dem Förderprogramm für Forschung und Innovation (Horizon 2020) unter der Nr. 646178.

www.nanocathedral.eu

Fig. 19: Roll-up about Nano-Cathedral (in German translation)