A New Antigraffiti Coating for the Conservation of European Monuments

André Laschewsky

Fraunhofer Institute for Applied Polymer Research (IAP)

Potsdam-Golm / Germany

Graffiti - A Threat to Cultural Heritage

graffiti acts at several levels:

- unpleasant
- deteriorates the social environment
- costly to remove
- damages the substrate

The Problem

building at the Charlottenhof entrance to Sanssouci imperial gardens at Potsdam

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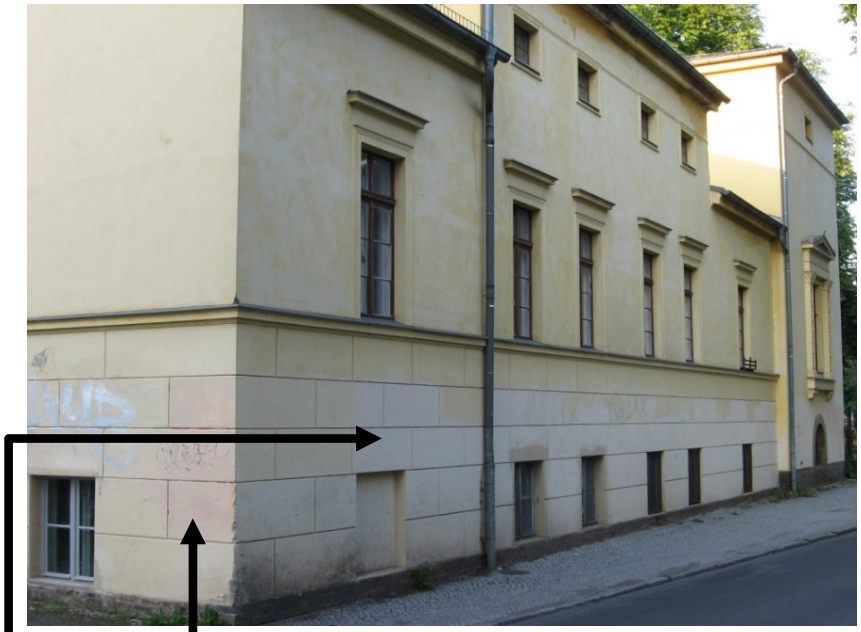

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- inappropriate cleaning: wall colour is changed by graffiti removal

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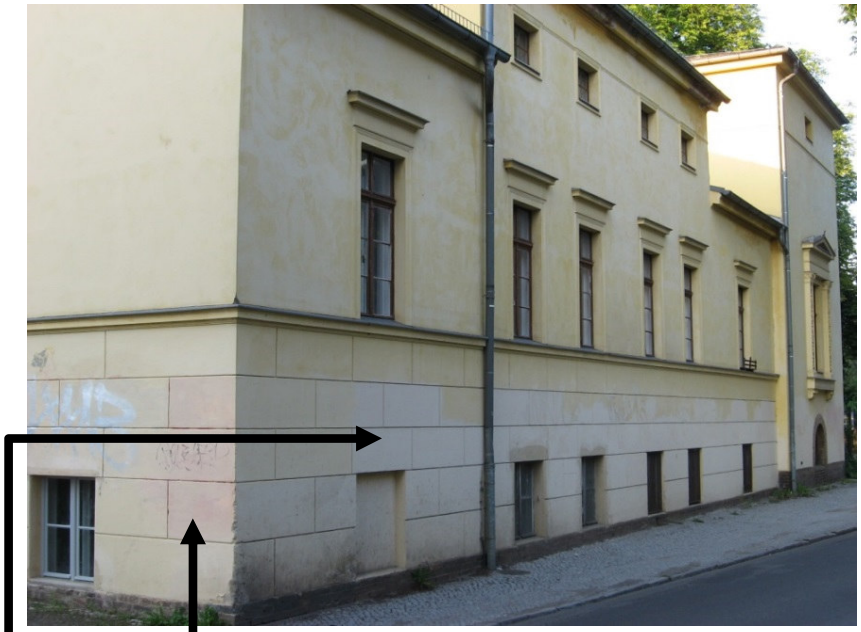

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needed:
- effective and lasting protection even after removal of graffiti
- harmless for the substrate material

+ option for mild removal of the protective coating when desired

Anti-Graffiti Coatings for Cultural Heritage - Requirements

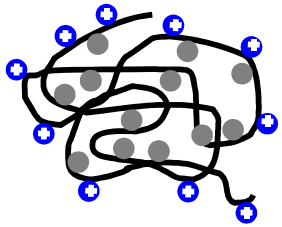
Aspired Properties	Polymer Design Element
• low surface energy, repulsion of liquid water	➢ hydrophobic blocks
• good adhesion to architectural heritage materials	➢ polar building blocks
• permeable to water vapour	➢ hydrogel character
• stable to sunlight and weathering resistant to (acid) rain, or mechanical stress	➢ (meth)acrylic materials
• transparent, preferably matte	➢ amorphous structure
• water-based formulation	➢ good colloidal stability, low filming temperature
• removable at will under mild conditions	➢ sensitive to aqueous base

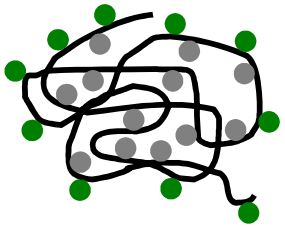
Anti-Graffiti Coatings for Cultural Heritage - 2 Constituents

surface
= neutral - weakly acidic environment

exposed to high pH:
→ cationic charges suppressed

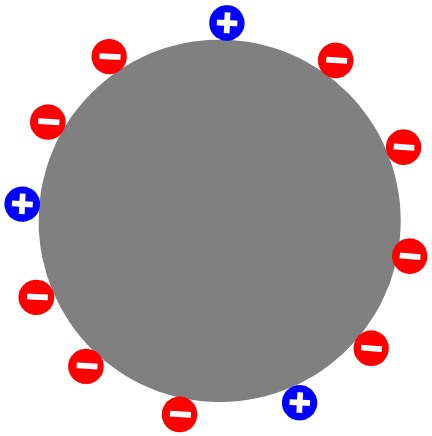
hydrophobised
polycation

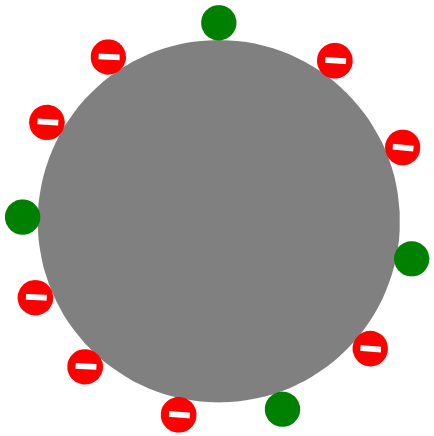




non-ionic
polymer

amphoteric
latex

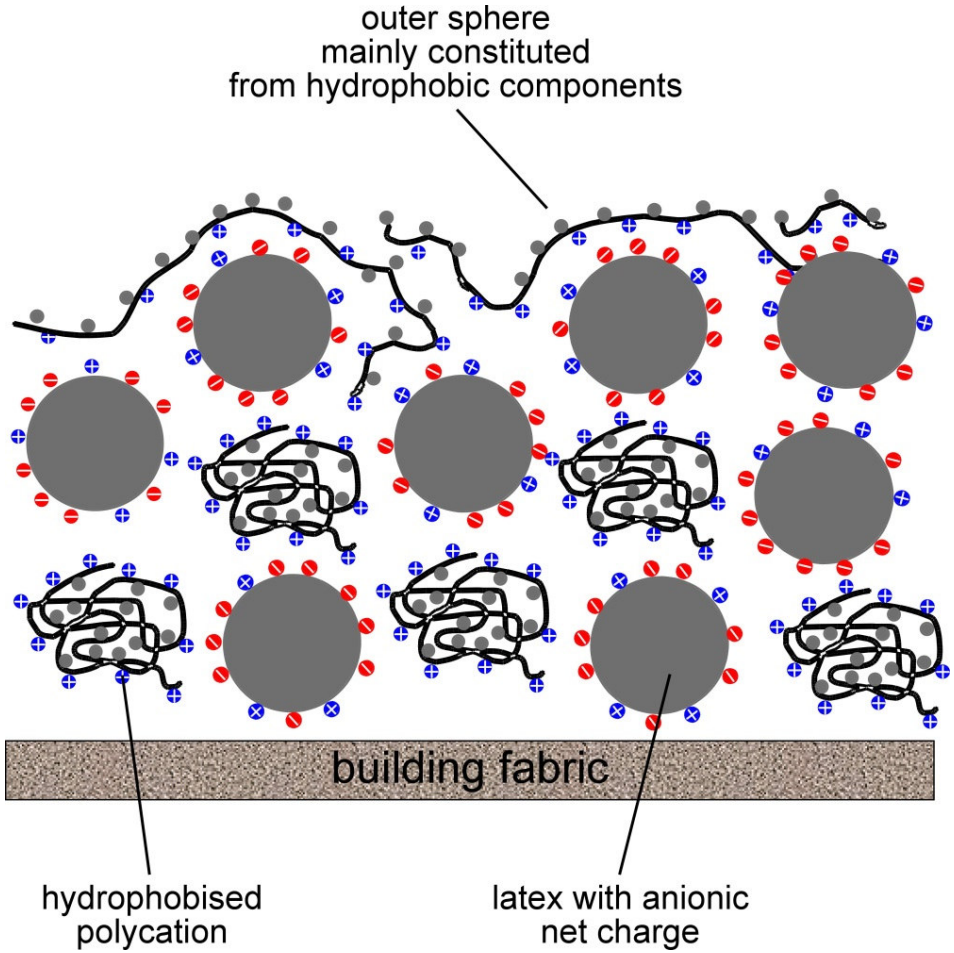




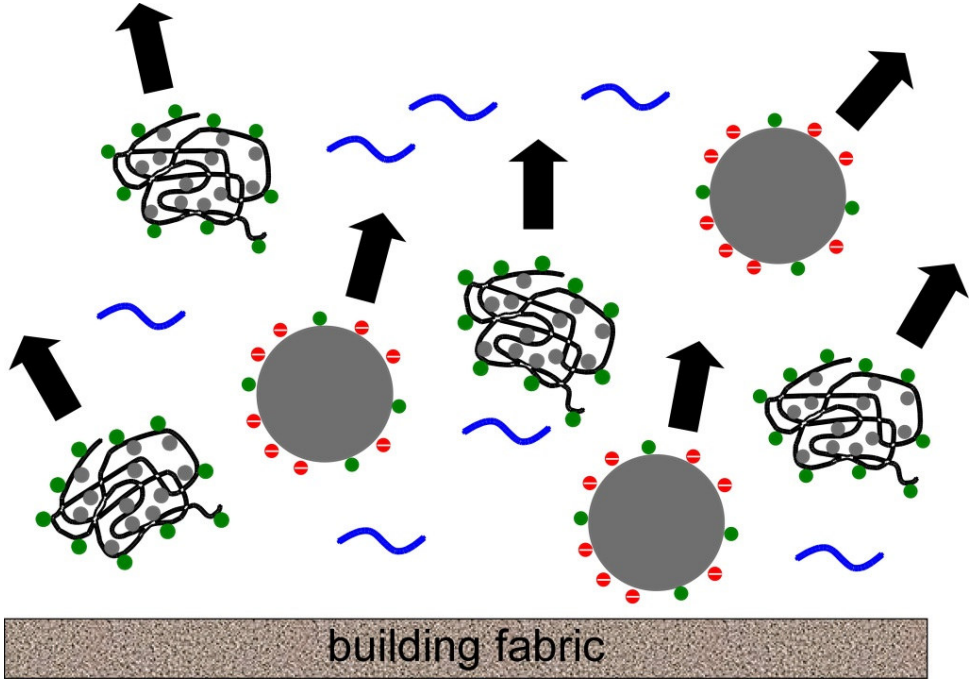
anionic
latex

Anti-Graffiti Coatings for Cultural Heritage – Mode of Action

stable film during use



removal



Performance Testing – Initial Laboratory Tests

gothic brick – plain texture

gothic brick – porous texture

Belgian limestone

right side of stones treated with anti-graffiti coating

↓

application of typical graffiti paint

↓

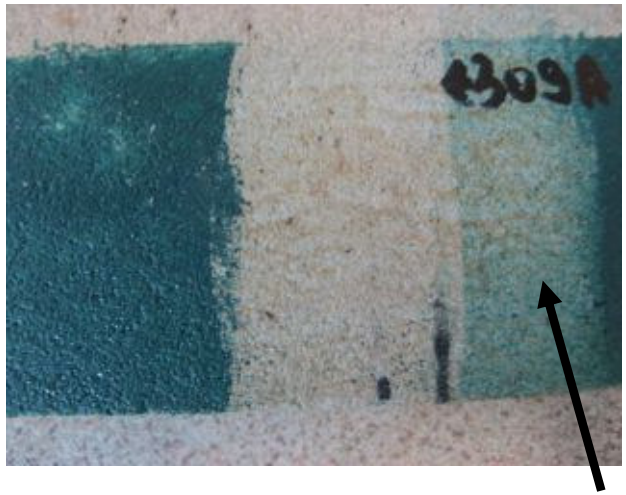
cleaning attempt on entire surface

⇒ successful removal of graffiti from treated areas

K. Manczyk, A. Dworak
Centre of Polymer and Carbon Research
Polish Academy of Sciences CMPW-PAN

Performance Testing – Initial Laboratory Tests

Strtenica calcareous sandstone	Baumberg calcareous sandstone	Galdakao's siliceous sandstone



area without coating

⇒ successful removal of graffiti from treated areas

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From Lab Scale to Commercial Scale Production

2005 – 2008

EU funded project “GRAFFITAGE”:

development of the concept

small scale synthesis (max. 4 litres)

initial small scale field tests

2011 – 2013

EU funded project “EFFACEUR”:

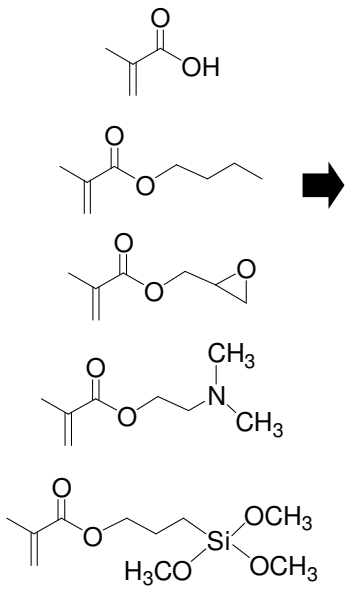
adaptation to large scale production

large scale synthesis (max. 500 litres)

extended field tests on historical buildings

Development of Polymer Components: Scale-Up

molecular design



laboratory

5 L

mini plant

50 L

pilot plant

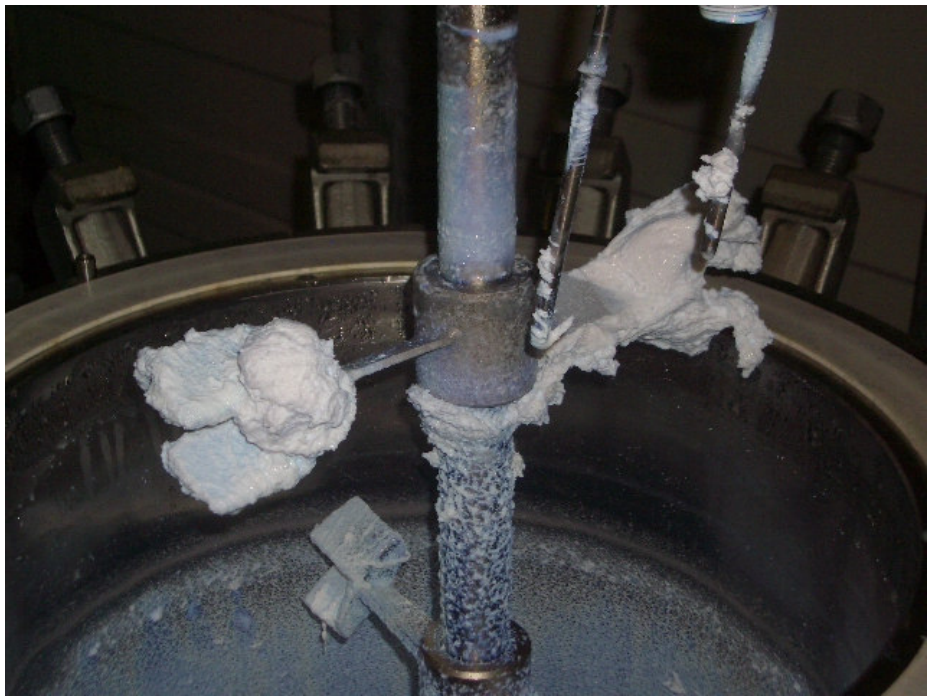
500 L

Typical Challenges During Scale Up

graffitage

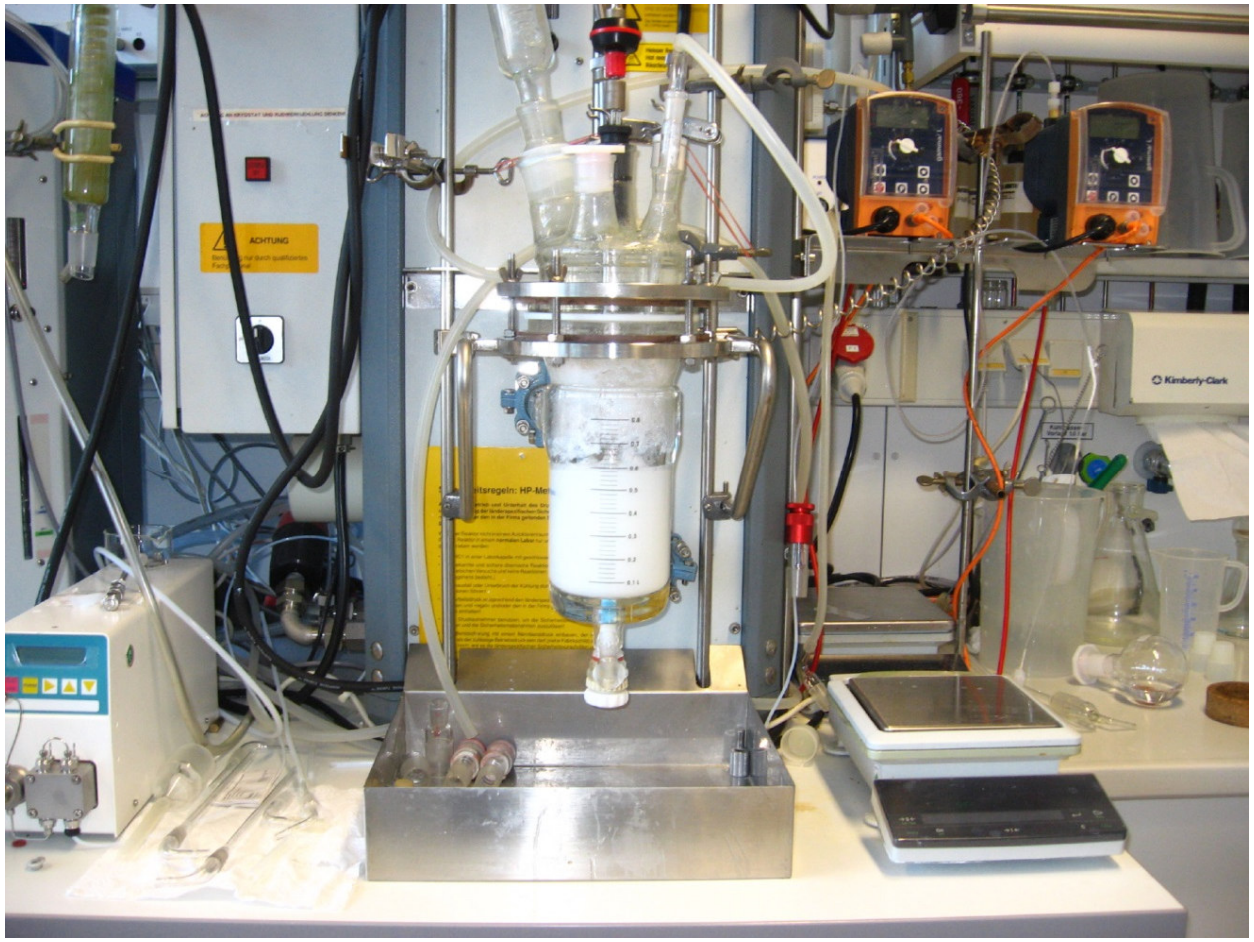
EFFACEUR

- raw material costs
- elimination of purification steps
- heat dissipation (altered surface/volume ratio)
- reactor layout (stirrer geometry etc.)
- particle size distribution, gelling



Iterative Scale up to Industrial Scale – First Step

on-line monitoring of reaction parameters in multi-sensor reactor



Iterative Evolution up to Industrial Scale

material for field testing
(100+ litres)

hydrophobized polycation
0.5 ton scale run

Examples of Recent Field Tests

enclosing wall of a historical manor
in Northern Germany

Hartmuth Boron
Nortech GmbH
Anti-Graffiti-Systeme
Springe, Germany

museum building of the
Great Western Dockyard at Bristol (UK)
SS Great Britain

Robert Turner
EURA CONSERVATION LTD, Telford (UK)

Summary

- anti-graffiti coating based on two main components
- permanent protection
- removable on demand without damage
- permeable to water vapour
- permits effective removal of graffiti
- scale up to industrial level demonstrated
- field tests on historical monuments in Europe in progress

Acknowledgements

project “GRAFFITAGE” supported by EC

project “EFFACEUR” funded by EC

Ayuntamiento de Bilbao

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