

MICRO AND NANOMATERIALS FOR THE BIOCLEANSING OF CULTURAL HERITAGE

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NASIERTECH srl



BIOLOGICAL PATINAS: PROBLEMS



70% of Cultural Heritage is in Italy



30% is outdoors



Biological Patinas on the surface caused by:

- Rain
- Sun
- Organic Materials

Many artifacts also are subject to biological attack , due to humidity and temperature

BIOLOGICAL PATINAS: PROBLEMS

Biological Patinas

Mould, Cyanobacteria, Algae, Lichens, Bacteria

- **Physical damage** : Mechanisms which cause micro- or macro- breaking of the substrate due to mechanical action of bodies.
- **Chemical Damage** : Mechanisms of alteration due to the effects of metabolic processes operated by these organisms .



BIOLOGICAL PATINAS: STATE OF ART

Biological Patinas can be **removed** from the artwork surface by:

- Mechanical Methods** → Scalpels, Brushes etc. **Very simple to use but don't remove the patina completely.**
- **Physical Methods** → Remove the patina thanks to electromagnetic radiations (UV, Gamma, Beta), Temperature, Microwaves ect. **Very expensive methods, are not safe for the operator and can react with the surface of the artifacts.**
- Chemical Methods** → Biocides and pesticides based on Quaternary ammonium salts , inorganic compounds such as sodium hypochlorite or hydrogen peroxide , alcohol , sodium dithiocarbamate , Pyridines. **Very toxic for the operator and for the environment, not selective, long time of application.**



BIOLOGICAL PATINAS: STATE OF ART

ENZYMATIC PATINA REMOVAL

Very selective, great results, does not react with the surface

- It's very difficult to maintain the correct pH and Temperature, specific for every kind of enzyme
- Can't be used for large surfaces
- It's very expensive



BIOLOGICAL PATINAS: INNOVATION



NASIER® GEL



Micro and NanoMaterials with enzymes modified by Nasiertech technology



Large specific area, can be used as a liquid, gel, solid etc. very selective method, non-toxic for the operator and the environment

BIOLOGICAL PATINAS: THE BEGINNING



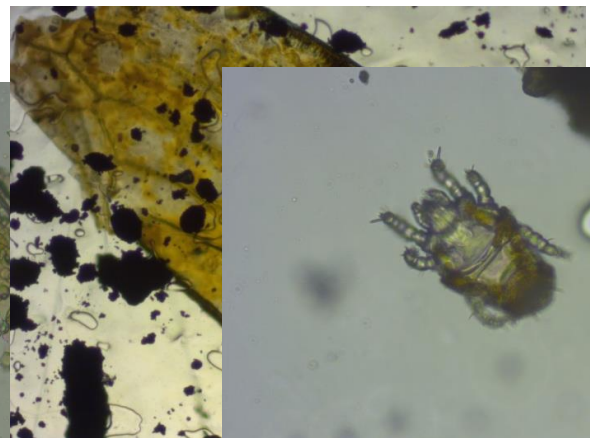
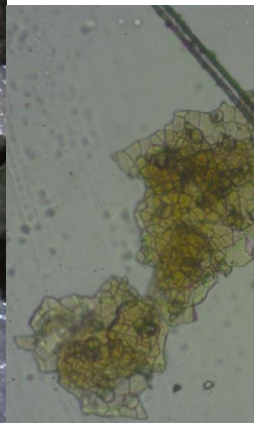
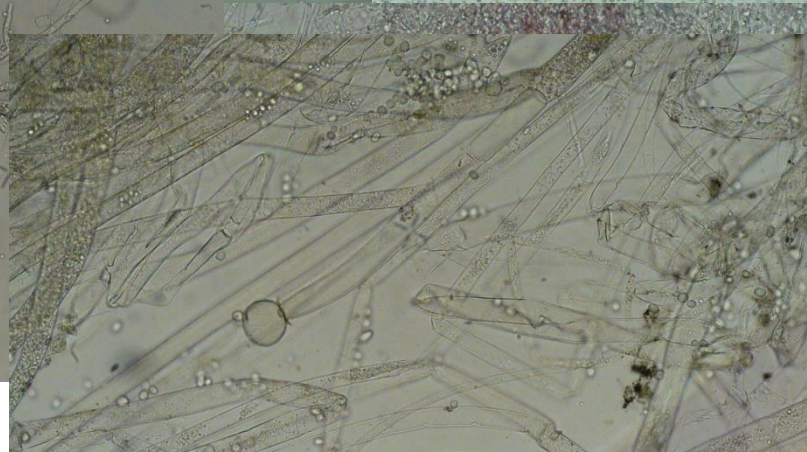
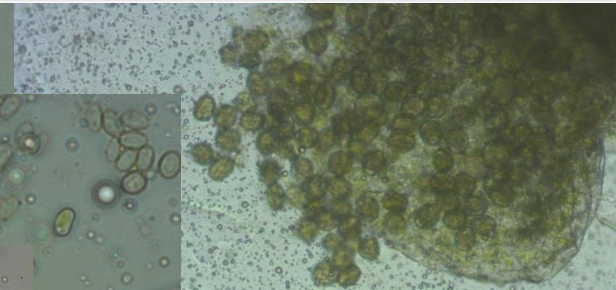
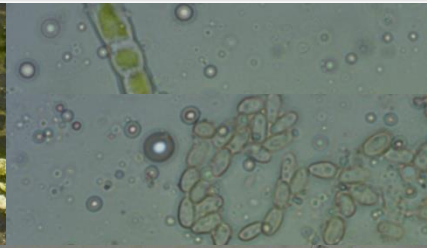
Floor Mosaic from Caracalla Baths, Rome (Thanks to Marina Piranomonte from the Superintendence of Rome), chosen as an outdoor artifact

BIOLOGICAL PATINAS: THE BEGINNING



Capital from Caracalla Baths, chosen as an indoor artifact

BIOLOGICAL PATINAS: THE BEGINNING

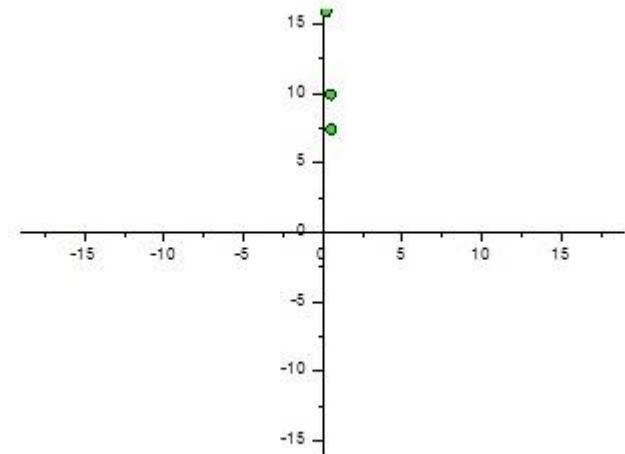
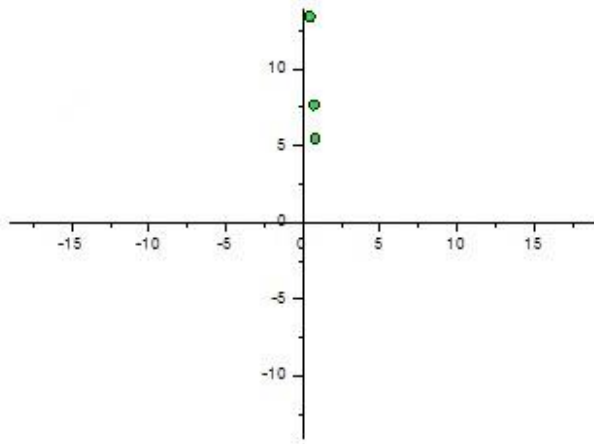
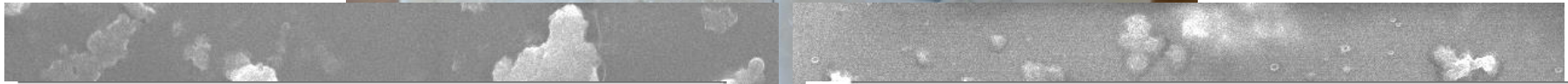


BIOLOGICAL PATINAS: ANALYSIS

Micro and Nanomaterials with enzymes



Enzymes



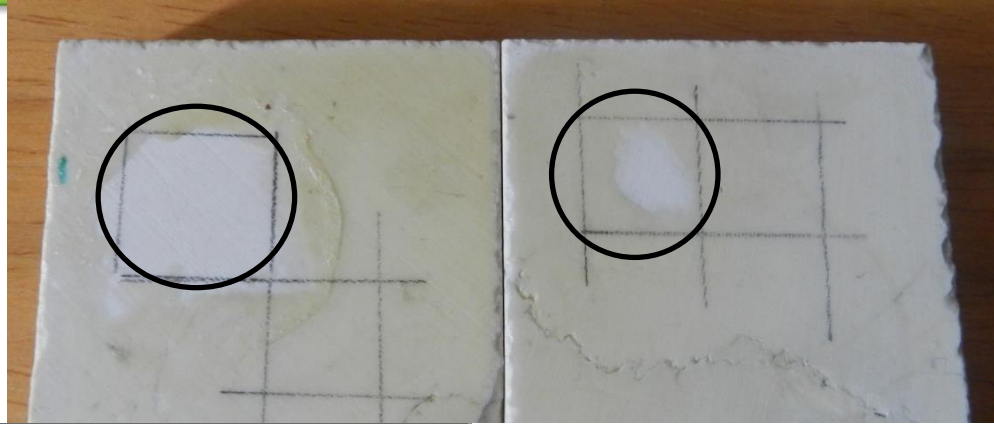
Both Surfaces are clean from the test substrate

90 Minutes

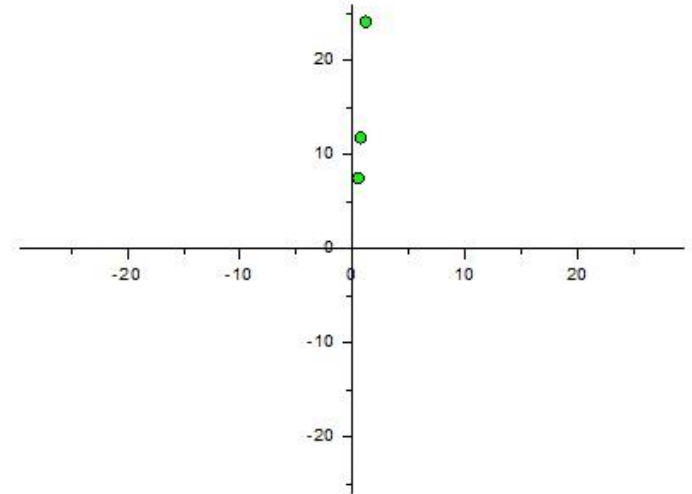
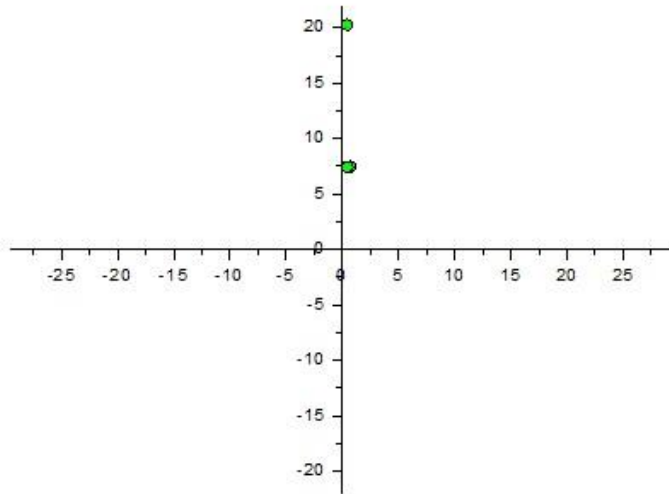


BIOLOGICAL PATINAS: ANALYSIS

Micro and Nanomaterials with enzymes



Enzymes



90 Minutes

Micro and Nanomaterials with enzymes are more efficient

BIOLOGICAL PATINAS: TEST

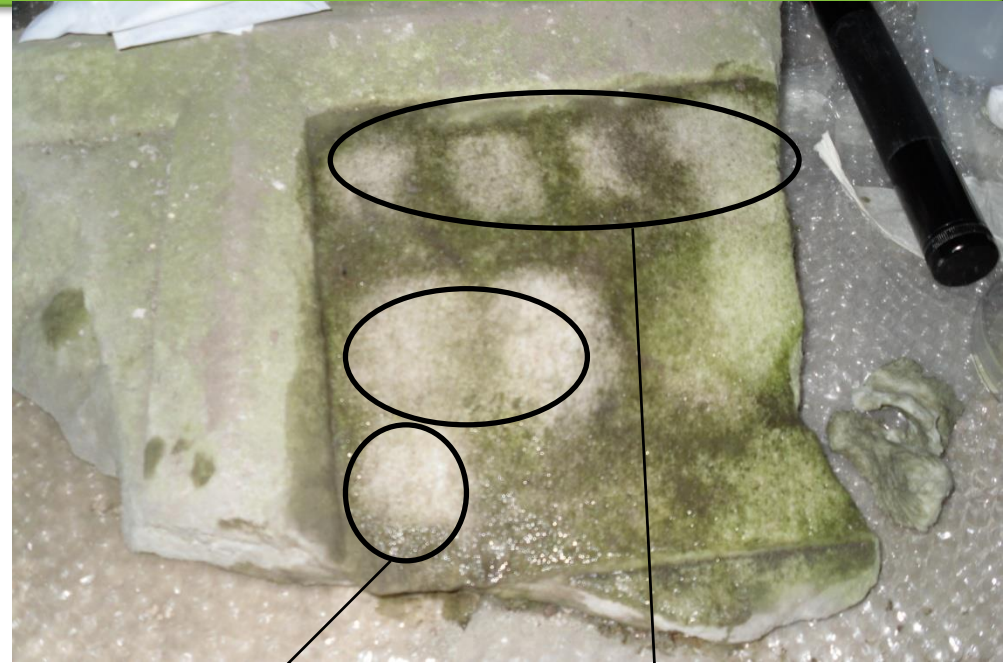
**Micro and
Nanomaterials with
enzymes**

Enzymes



90 Minutes

BIOLOGICAL PATINAS: TEST



Micro and Nanomaterials with enzymes

Enzymes



90 Minutes

BIOLOGICAL PATINAS: NASIER® GEL



Nasier® Gel



Can be used to remove Biological, Organic and Acrylic Patinas from any kind of surface:

- Simple to use
- Only one application
- Non-Toxic for operators and the environment
- 30 minutes of application (stone) 3-5 minutes (other artifacts)

BIOLOGICAL PATINAS: NASIER® GEL



3 Minutes



Fungi Attack on Painting
before Nasier gel treatment

Painting after Nasier
gel treatment

BIOLOGICAL PATINAS: NASIER® GEL



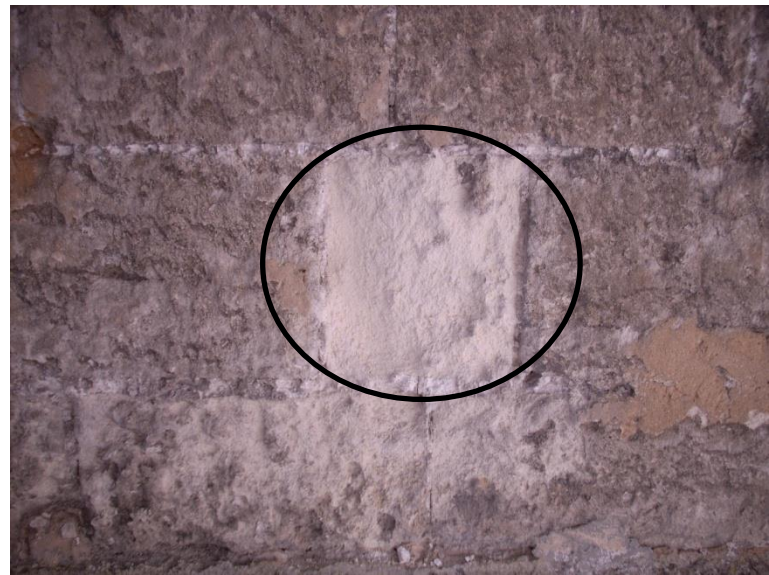
Lichen attack before Nasier gel Treatment



After Nasier gel Treatment



30 minutes





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THANKS FOR YOUR ATTENTION