



Protection against biological colonization.

IS IT:

Product

Technology

Equipment

APPLICABLE FOR:

Restoration

Rehabilitation

New Construction

APPLICABLE ON:

1. Foundations and underground structures

2. Vertical structures

3. Horizontal structures and vertical connections

4. Roof and terraces

5. Façade and building envelope

6. Finishes and completion elements

7. Integrated services

8. General strategies for building recovery

Related companies: *Algophase; New Des 50; Desogen; PREVENTOL® RI80; BC Disinfectant biocide; Biotin T; Kimistone BIOCIDE; Benzalkonium chloride (Salts of quaternary ammonium); Borax; Salts of boron L10 Solas; Essential oil extracted from plants.*

DESCRIPTION

The biological colonization of monuments displayed outdoors is a process that involves different groups of microorganisms, photosynthetic and otherwise, and which leads to the formation of variously colored patinas.

To counter the spread of biological patinas on stone materials, restorers generally perform disinfection treatments with biocidal chemicals.

The biocides that can be used in the field of restoration/rehabilitation of cultural heritage are not numerous, as they must meet various requirements such as efficacy at low concentrations against target organisms, non-interference with the constituent material of the building, and low risks for the man and the environment.

Currently, with a view to an environmentally friendly restoration, the interest of many researchers is shifting to the use of innovative biocides with low environmental impact such as natural plant extracts.

(<https://www.youtube.com/watch?v=Oc63ZguZqCc>)

The use of ad hoc formulations using, for example, essential oils has allowed the elimination of substances with biocidal activity which present, in the concentrations of use, a high environmental impact, thus allowing to work with greater respect for the environment. of operators and artifacts.

In fact, recently, the need for green methodologies has meant that - by applying the best practices in use in the health sector also to the conservation of cultural heritage (stone materials, plasters, organic materials, etc.) - alternative systems capable of giving benefits were applied tangible ecological, thus promoting the possibility of implementing both preventive and maintenance conservation.

Concentrated Algophase is an algaecide-lichenicide with prolonged efficacy for the fight against microflora on stone materials and where protection over time against fungal infections is desired (green and brown algae, lichens, molds, micro-fungi etc, also in association with bacteria).

New Des 50 is a concentrated preservative (50%) based on quaternary ammonium salts. It is used, in aqueous solutions, with other reagents and inert materials, for the

preparation of cleaning poultices to be applied to stone surfaces and frescoes.

The most famous chemical cleaning poultice inside which New Des 50 confirms its efficacy is AB 57 (I.C.R. formulation - Rome).

DISINFECTANT BIOCID is a neutral product, based on specific disinfectant agents, suitable for cleaning and disinfecting building substrates attacked by biodeteriogens such as mosses, lichens, and other microorganisms.

BC BIOCID DISINFECTANT, given its wide spectrum of action, is able to eliminate algae, mosses, lichens, yeasts, molds and bacteria responsible for the biodeterioration of architectural materials.

The field of use of BC BIOCID DISINFETTANTE is the disinfectant treatment of natural stone (marble, granite, travertine), brick, concrete, monumental stone elements, absorbent building materials and finishes.

Aqueous **solution of BENZALCONIUM CHLORIDE** (a quaternary ammonium salts) concentrated at 50%, characterized by a high disinfectant-germicidal and detergent capacity, with a wide spectrum of action also on fungi, yeasts, Gram + Gram- bacteria, algae and microflora in general .

BENZALCONIUM CHLORIDE is used in the restoration for the disinfection and cleaning of various surfaces, such as: marble, stone, wall paintings, ceramic materials, metals, natural rubbers, synthetic rubbers, fabrics, paper, etc.

The biocidal action is very fast (12-24 hours), while its permanence is limited in time. To also have a cleansing effect, BENZALCONIUM CHLORIDE can be added with surfactants.

Boron salts are used against mold of walls and wood. On the walls they offer a preventive action and long-term protection against mold and fungi, while on the wood the salts protect against the aggression of woodworms, fungi, molds, and rodents.

In the case of application on the wall, the complete drying is awaited, the residues of mold are brushed off and the whitening proceeds. In the case of wood, it is necessary to wait for the complete evaporation of the water, brush any residues and impregnate.



WHY TO USE

Biocidal products are useful for carrying out interventions for the removal of bacteria, molds, algae and lichens from stone materials, plasters, wood, and ceramics.

The biocides used for environmental disinfection and therefore to destroy contaminating pathogens on surfaces, materials, equipment, and furniture, preserve various materials from deterioration in order to prevent the formation of bacteria and extend their conservation.

In fact, biocides contain active substances or microorganisms (active ingredients) effective against harmful organisms (including microorganisms) in order to destroy them.

The direct biocidal action on microorganisms is called disinfection; the control action of the higher plants is called weeding. In the agricultural field, the action is carried out by pesticides.

HOW TO USE AND APPLY

The assessment of the need for the use of a specific biocidal product must take into account the species to be eliminated or reduced, the growth conditions, the relationship with the substrate, the extent of the damage, the duration and the real opportunity of the treatment in relation to the speed of growth and aggressiveness of the species itself.

The effectiveness of the biocide treatment has a temporary value and depends on the methods used: physical, chemical, biological and, for preventive purposes, can be achieved with periodic programming in the annual maintenance plan. Biocidal products can be harmful to health and the environment.

BENZALCONIUM CHLORIDE, for example, must be used exclusively in aqueous solutions in concentrations ranging from 0.3 to 0.6% (3-6 ml / 1 liter of water).

The use of solvents with alcoholic fractions facilitates cell penetration but can cause the release of photosynthetic pigments.

BENZALCONIUM CHLORIDE can be applied, after suitable dilution with water, directly on the micro and macro flora to be eliminated by spraying (e.g., with a manual pump), injection (in this way the dispersion of the solution outside the treatment area is avoided) or as a compress (using cellulose pulp).

APPLICATION METHODS

The Biocide treatment is performed with broad-spectrum biocidal substances capable of acting both on mosses and lichens and on higher plants rooted in the masonry.

This treatment is followed by the eradication of the plants and the washing of the surfaces. After a sufficiently long time, the material is thoroughly rinsed, paying particular attention to the removal of bio-deteriogenic residues and powdery deposits.

This is followed by manual washing with neutral detergents and subsequent washing with brushes and deionized water. The washing operations are concluded with a general rinse with water jet cleaners at controlled pressure, if possible, to remove surface dirt residues.

Apply the biocide, with a brush or with a low-pressure dispenser, abundantly covering the area to be treated. Wait 15/20 minutes, then rinse thoroughly with pressurized water.

Complete the cleaning of the support, if necessary, with the appropriate cortical cleaning treatment. In areas where there are layers with a considerable thickness of microorganisms, it is recommended, in advance, to brush or wash the surface with pressurized water, in order to remove the more superficial layers and allow better penetration of the product. After cleaning to prevent the formation of bio-deteriogens, on a dry surface, apply the biocide again.

To prolong the disinfectant action of BC Biocide, always apply the protective most suitable for the specific case on a dry surface. The use of the biocide must precede all other cleaning and / or protection systems.

TECHNICAL CHARACTERISTICS

Liquid, clear and slightly oily.

Usually soluble in water, ethyl, methyl, isopropyl, glycols and ketones.

RECOMMENDATIONS AND OTHER INFORMATION

The use of the biocide, especially if not a **green or natural** product, must be done with the utmost attention and caution on the part of the operator who, during

application, must use personal protective equipment (accident prevention).

During the treatment, care must be taken not to cause mechanical stress or breakage of the support to be treated.

It would also be preferable to avoid the use of methods that involve the use of large quantities of water both because they are potentially harmful to the already deteriorated stones (on which biological attacks, salt formations and detachments of material could be generated), and because they can cause infiltrations inside the masonry.

Particular care must be taken in the removal (not always necessary) of biological patinas or infesting vegetation, since especially in the presence of plants, an imprudent mechanical extraction could compromise the support. It is therefore first of all necessary to wait for the vegetation to dry and then remove it at a later time.

EXAMPLES

In the case of stone or plaster disinfection, it can also be associated with other cleaning products through compresses with cellulose pulp or sepiolite or attapulgit, absorbent clays used as an inert filler in the preparation of pulp or cleaning compresses for stone surfaces and frescoes, to which confers supporting and absorbent properties.

Recently, **the use of nanotechnologies** was transferred to the restoration sector bringing many innovations. Titanium dioxide (TiO₂) is the main nanostructured material used to prevent the comparison of weathering traces, to obtain self-cleaning materials and to slow down biofouling as well. Its potential use was tested on common traditional materials like sandstone, limestone, and bricks. The self-cleaning ability of this innovative material, as well as its biofouling prevention were evaluated in laboratory simulated tests. Results show the high potentiality of this nanomaterial in making the tested archaeological surfaces self-cleaning and biocide.

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IMAGES AND CAPTIONS



Fig.1-2: Palatina Chapel in Palermo, inside the Royal Palace; disinfestation of the extrados of the muqarnas wooden ceiling. © *Superintendence of Cultural and Environmental Heritage of Palermo*



Fig.3: Chemical weeding sprayed on a sculptural element. © <https://www.antichitabelsito.it/biocidi.htm>



Fig.4: Mechanical removal of dust and incoherent deposits and chemical weeding. © <http://www.amicidelcolosseo.org/2014/>



Fig.5: Removal of biological colonizations by sponging and weeding using a biocide.

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