

NANOSILVERAG



by **AditivosCerámicos**

ANTIBACTERIAL SOLUTION



The calm of a safe environment with **NANOSILVER AG®**



***NANOSILVER AG®** is a registered brand within the intellectual property laws in the European Union.

NANO SILVER AG



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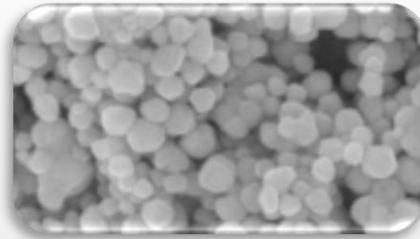
DESCRIPTION

The bacteriostatic additive NANOSILVER AG® is a colloidal dispersion of silver nanoparticles. The Ag np are capable of creating an antibacterial effect on treated ceramic surfaces to provide them with permanent bacteriostatic and hygienic properties on the glaze area, equipping its outwards with bactericide and fungicide features.

Silver is a natural preserving metal and its use dates back to ancient times. The presence of colloidal silver particles inhibits the bacterial growth, both in the liquid grinded glaze and at the final fired pieces.

In contrast to the traditional preserving agents, the silver nanoparticles remain on the surface of the glazed tile so its effects last and do not fade over time.

The released silver with this additive does not colour the glaze as it maintains all of its traits intact. The result of this being that there are not changes in tonalities or other unwanted reactions visible on the surface of the final treated piece.



The silver nanoparticles are 6-10 nm.

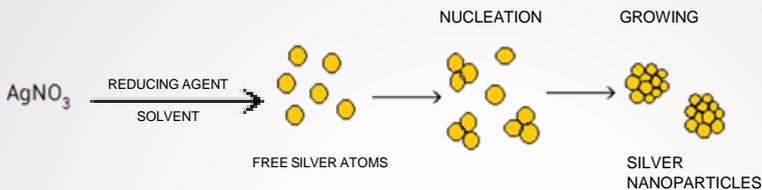
PURPOSE

- ✓ To provide treated pieces with bactericide and fungicide traits
- ✓ To eliminate bacterial strains
- ✓ To substantially improve the live quality of people
- ✓ To reduce unpleasant odours by removing germs
- ✓ To sterilize surfaces
- ✓ To grant high added value to processed pieces

SYNTHESIS

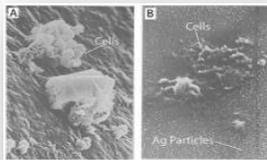
The silver nanoparticles are obtained through a **green chemical synthesis** more respectful to the environment and in which the usage of chemical agents associated with environmental toxicity are completely suppressed.

- ✓ Green chemical synthesis
- ✓ Benign solvents
- ✓ Zero environmental toxicity



WORKING PROCEDURE

The activity of the silver nanoparticles is closely related to its transformation in biological environments, including the rusting of the surface, silver ions release and the interaction to biological macromolecules.



The silver treatment leads to the dehydration of the microbial cells. A) *Staphylococcus aureus* without silver treatment. B) *Staphylococcus aureus* on a material that contains micro dispersed silver nanoparticles.

The capability of the Ag-np to destroy infectious microorganisms makes **NANOSILVER AG[®]** one of the most powerful antimicrobial agents. This activity has been proven effective against prokaryotic organisms, including bacteria, fungus or viruses.

The silver nanoparticles and the Ag^+ ions released on surfaces destroy compounds containing sulphur and phosphorous such as the DNA and proteins of the pathogens. This damages the cellular membrane and those protein functions that lead to the cellular death and destruction of pathogens.

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ANTIBACTERIAL SOLUTION

DESCRIPTION

The **NANOSILVER AG®** additive is to be applied on glazes and coverings to provide every treated piece with a permanent bacteriostatic effect.

CHARACTERISTICS

- ✓ Non-allergenic and non-toxic.
- ✓ Nanoparticles sizes in a range of 5 to 20 nm, with the 99% below 15 nm.
- ✓ Thermal stability even above 1300°C/2372°F.
- ✓ UV light stable and fade resistant.
- ✓ Cleaning and abrasion high resistance.

TECHNICAL SPECIFICATIONS

NATURE	Dispersion of encapsulated silver nanoparticles
APPEARANCE	Amber coloured liquid
SOLUBILITY	Complete solubility in water
APPROX DENSITY	1.056 g/cc

DOSAGE

With a dosage level of 0.2% added to the dry weight of the glaze, **NANOSILVER AG®** has been proven to achieve more than a 99.9% efficacy on bacteriostatic activity against microorganisms such as Escherichia Coli CECT 434 and Staphylococcus aureus CECT 239 according to JIS Z 2801:2010 and ISO 22196:2011 regulations. It has also demonstrated a fungicide effect.

PRESENTATION AND STORAGE. CONSIDERATIONS

NANOSILVER AG® is available in 1 Kg bottles, 5, 10 and 25 Kg jerricans and 120 Kg containers.

Plastic containers are not to be returned but destroyed and managed as urban assimilable waste.

Avoid water contamination and direct contact with foodstuff.

NANOSILVER AG® must be stored in its original packaging protected from direct sunlight or any strong light source and extreme temperatures. This additive is advised to be used before the four months after its production date.



DETERMINATION OF ANTIBACTERIAL EFFECTIVENESS OF CERAMIC SURFACES TREATED ACCORDING TO JIS Z 2801: 2010 STANDARD

This tests were carried out in a certified laboratory between 08/10/2020 and 08/15/2020. The tests were carried out by procedures based on the JIS Z 2801: 2010 standard "Quantitative determination of the antimicrobial efficacy of treated surfaces".

CONSIDERATIONS

The tests are carried out both on the test sample "treated sample" and on a "control sample" of the same material without treatment.

According to the internal laboratory procedure, bacterial suspensions of a known concentration of 106 cfu/mL were obtained. With these concentrations, the surfaces of the samples were contaminated in order to carry out the test and after 24 hours of the inoculum being in contact with the matter, the counts of the different bacteria on the samples were analyzed.

The microorganisms used were:

- Escherichia coli (CECT 434)
- Staphylococcus aureus (CECT 239)

RESULTS

ESSAY NUMBER	SECTOR	SAMPLE	BACTERIA	ANTIBACTERIAL ACTIVITY ACCOUNT*
20_146521	CERAMICS	GLAZE WITH 0.2% NANOSILVER AG	E. COLI	> 99.9%
			ST. AUREUS	> 99.9%
20_146519	PAINT	GLOSSY VARNISH WITH 0.2% NANOSILVER AG	E. COLI	99%
			ST. AUREUS	99%
20_146520	PAINT	MATT VARNISH WITH 0.2% NANOSILVER AG	E. COLI	99%
			ST. AUREUS	99%

*R ACCORDING TO JIS Z 2801:2010

CONCLUSIONS

- ✓ **NANOSILVER AG®** has an antibacterial effect and generates a reduction in the content of bacteria greater than 99%.
- ✓ The reduction of bacterial activity is quantified and demonstrated in all the treated pieces.

ACTIVITY AND EFFECTIVENESS TEST

The **JIS Z 2801 method** is specifically designed to evaluate the antimicrobial activity and effectiveness of those surfaces with antimicrobial traits, including intermediate products independent of their material. This test covers textile, plastic, metal and ceramics.

ASTM E2149-01 Antibacterial Activity		
SAMPLE DESCRIPTION	GRAM - <i>Escherichia coli</i>	GRAM + <i>Staphylococcus aureus</i>
Untreated control	0% Reduction	0% Reduction
Silver Treated surface	99.99% Reduction	99.99% Reduction

With a minimum dosage level of 0.2 % added to the dry weight of the glaze, **NANOSILVER AG®** has been proven to achieve more than a 99% efficacy on bacteriostatic activity against microorganisms such as *Escherichia Coli* ATCC 8739 and *Staphylococcus aureus* ATCC 6538, according to JIS Z 2801:2000 and ISO 22196:2007 regulations. It has also demonstrated a fungicide effect.

Antibacterial tests



UNTREATED TREATED

Fungicide tests



UNTREATED TREATED

BENEFITS



- ✓ **MINIMUM IMPACT ON THE FINAL COST**
- ✓ **HIGH EFFECTIVENESS IN LOW DOSAGES**
- ✓ **PERMANENT ANTIMICROBIAL EFFECT**
- ✓ **ORIGINAL DESIGN UNALTERED**
- ✓ **THERMAL STABILITY EVEN ABOVE 1300 °C / 2372 °F**
- ✓ **NON-ALLERGENIC. NO CUTANEOUS SENSITIVITY**
- ✓ **UV LIGHT STABLE AND FADE RESISTANT**
- ✓ **ABRASION AND CLEANING HIGH RESISTANCE**

NANOSILVER BLUE

ANTIMICROBIAL SOLUTION

by AdivivosCerámicos

DESCRIPTION

In almost every production process multiple products are involved, and that sometimes makes it difficult to know which of those products are already in place.

The addition of **NANOSILVER AG®** does not cause any visible effect. And that is why we have come up with a new product called **NANOSILVER BLUE**, which includes a blue aniline for the glaze market that allows you to be able to be sure when this additive is on the mix and the pieces are being treated.

The **NANOSILVER BLUE BLUE** has the exact same properties as the original **NANOSILVER AG®** and its colour will definitely disappear after the pieces are cooked.

RESULTS

ESSAY NUMBER	SECTOR	SAMPLE	BACTERIA	ANTIBACTERIAL ACTIVITY ACCOUNT*
20_146521	CERAMICS	GLAZE WITH 0.2% NANOSILVER BLUE	E. COLI	> 99.9%
			ST. AUREUS	> 99.9%
20_146519	PAINT	GLOSSY VARNISH WITH 0.2% NANOSILVER BLUE	E. COLI	99%
			ST. AUREUS	99%
20_146520	PAINT	MATT VARNISH WITH 0.2% NANOSILVER BLUE	E. COLI	99%
			ST. AUREUS	99%

*R ACCORDING TO JIS Z 2801:2010

CONCLUSIONS

- ✓ **NANOSILVER BLUE** has an antibacterial effect and provides with a reduction of the bacterial content with an efficacy higher than 99%.
- ✓ This reduction and elimination shows in every piece treated.

99%

PERMANENT EFFICACY

* In more than the 99% of the analysis and trials done the efficacy is higher than 99%.





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