smart NANOTECHNOLOGIES

ACTIVE SILVER

SILVEREPOXY

specialized biocidal and anti-corrosion coating

www.smartnanotech.com.pl

SILVER EPOXY

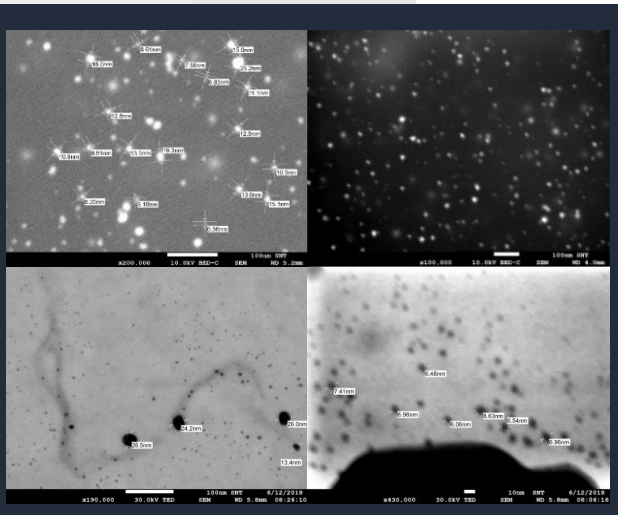
Is a functional coating for galvanised and stainless steel with biocidal and hydrophobic properties. Thanks to silver nanoparticles, these coatings are highly effective, durable and provide the protection of the coated surface against microbial growth. The coating also significantly increases the resistance of the surface to detergents, and thus reduces its susceptibility to corrosion, which leads to lower costs of using coated steel surfaces.

PRODUCT FEATURES

- **High microbiological activity (>99% reduction)**
- **Low migration of silver nanoparticles (<0.1 ppm)**
- **Many possible applications: furniture, air ducts, tools etc.**
- **Safe to use**
- **Detergent-resistant**
- **High cost effeciency**
- **Simple surface coating**

SEM and TEM analysis
sizes of silver nanoparticles

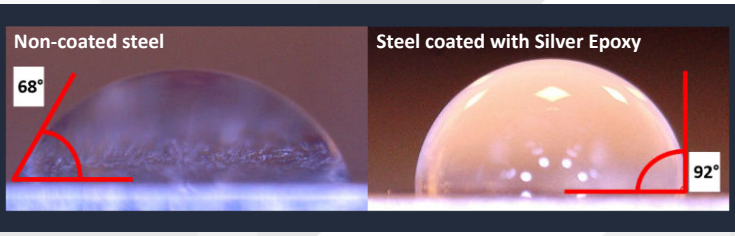
Silver nanoparticles (100 ppm) used as the active ingredient of the coating give it biocidal properties with a remnant effect. Sizes of silver nanoparticles are in the range of several to tens of nm, while the polymer used provides chemical stability.



The spherical shape and average sizes of silver nanoparticles of < 30 nm were confirmed with transmission electron microscopy.

Surface hydrophobization

Depending on customer needs, the coating can be hydrophobic to make it easier to keep the surface clean. The photo below shows contact angles for surfaces with and without our coating, which are used to assess surface hydrophobicity. Our coating provides a more than 20° increase in the contact angle.

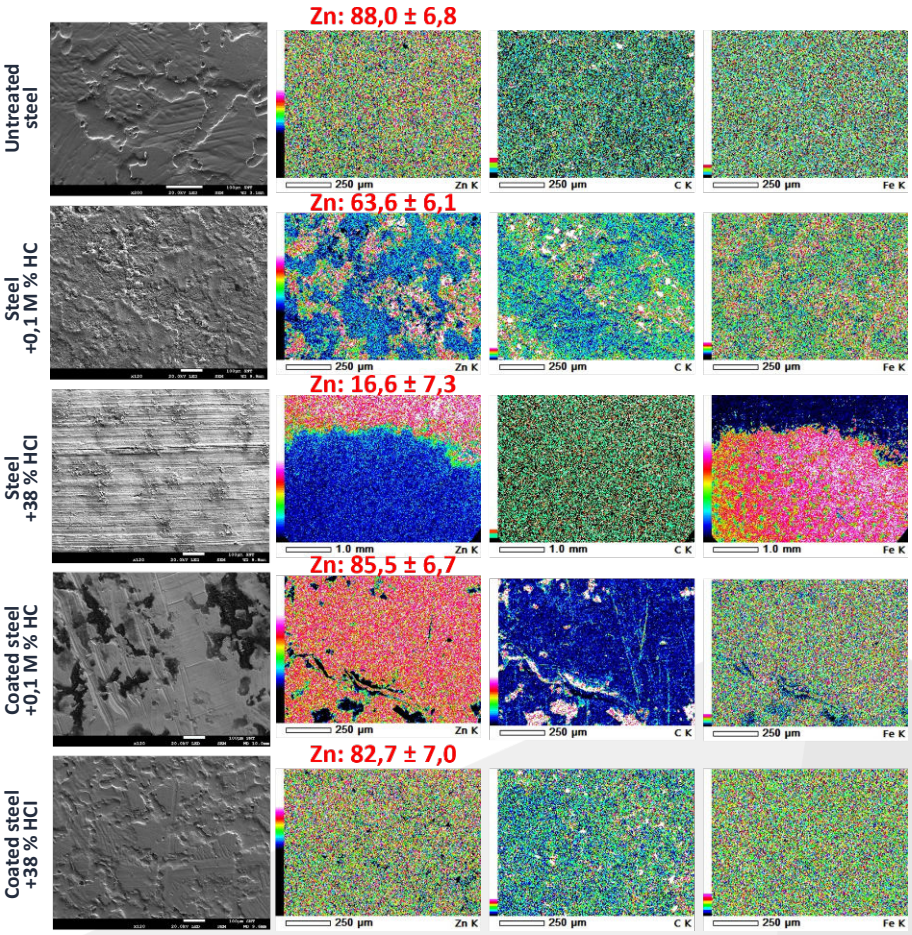


Contact angles for non-coated and coated galvanised steel

Corrosion resistance of the coating

The microscopic analysis of plates subjected to hydrochloric acid allowed us to assess morphology changes and losses of the zinc coating for steel with and without our coating. On galvanised steel, there is a heterogeneous layer of zinc, which is etched and damaged to the level of the steel surface by the acid. The surface morphology of steel coated with our product does not change – even after treating it with concentrated hydrochloric acid.

Further, the X-ray microanalysis of samples showed that the zinc content for steel samples treated with hydrochloric acid went down from 88.0 ± 6.8% to 16.6 ± 7.3%, but it did not change significantly for coated samples. On non-coated plates with zinc losses, the microanalysis confirmed an increased iron content, pointing to steel exposure, which was not the case in coated steel. The results are clear that the coated surface is resistant to environmental factors and does not show signs of corrosion progression.

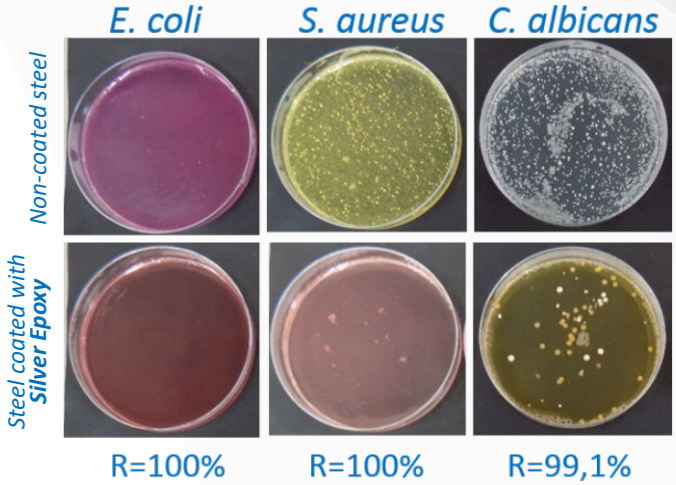


Recommended application parameters

- Distance of a gun to the painted surface: ideally 20 cm (range: 15 - 25 cm). For smaller parts, adjust parameters by changing the nozzle diameter and operating pressure.
- Gun operating pressure: approx. 7 bar
- Nozzle diameter: 1.5
- Dynamic viscosity values in the range of 400-600 mPas.
- Degrease the surface with alcohol or solvent and dry it before coating. Once dry, check the surface for any remaining dirt.
- Apply one layer.
- The pot life is 25 minutes at 20°C.
- 1 kg of ready mixture of Silver Epoxy A and B components is sufficient to cover from 30 to 50 m2 of surface (depending on coating thickness)
- Cure the coating at 60 - 80° C for 30 - 60 s.

Microbiological tests

Steel coated with Silver Exopy and control samples without silver nanoparticles were tested acc. to ISO 22196: Plastic - Measurement of antibacterial activity on plastics and other non-porous surfaces. The coating exhibits high antibacterial activity against the Gram-negative bacterial strain (*Escherichia coli*), the Gram-positive bacterial strain (*Staphylococcus aureus*) and the fungus (*Candida albicans*). For both bacterial strains, the reduction was 100%. For the fungus, it was 99.1%. The results confirm great microbiological potential of our coating, and thus its multiple possible applications.



Reduction in microorganism growth (R) after a 24-hour incubation due to the coating (control sample - steel without coating).

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