

Pigmented glass-like coatings for protection and decoration

Principle

Spray coating, thermal densification
at 400 – 600 °C, patent protected
technology

Properties

- High scratch hardness and abrasion resistance (IEC test < 150 µm, 500 cycles Scotch Britt sponge without any scratch)
- High temperature tarnish protection (>1000 h at 400 °C)
- Stable against food, household cleaners (60 °C) and hand sweat (100 h)
- Incorporation of sensitive pigments (e.g. Iridodin) Pearl Gloss® pigments) is also possible
- Elastic deformation possible, much less brittle than classical enamel

Application

- Abrasion resistant coatings for stainless steel, aluminum and brass
- in opposition to enamel: moldable, bendable, flexible replacement of anodization on Aluminum medical instruments, furniture, containers, tubing, analytical equipment and devices.



*Samples of Nanoseal® pigmented
glass-like coatings on metals*

Benefits

- New design for metal surfaces
- Shiny precious appearance through Pearl Gloss® pigments, combined with high durability
- Coating of complex shaped parts possible
- Low coating thickness (4 – 8 µm), low material consumption, low cost.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Glass-like coatings on stainless steel

Principle

Spray coating, thermal densification at 400 – 600 °C, patent protected technology

Properties

- Anti-fingerprint effect, easy to clean
- High scratch hardness and abrasion resistance (IEC test < 150 µm, 500 cycles Scotch Britt sponge without any scratch)
- High temperature tarnish protection (>1000 h at 400 °C)
- Stable against food, household cleaners (60°C) and artificial hand sweat (100 h)
- Anti stick effect against chalk and other deposits (exhaust gas) by planarization and smoothing of the surface
- Protection against acid attack and ion leaching in chemical reactors
- Incorporation of inorganic pigments and colouring are possible (new design for stainless steel).

Application

- White goods, indoor architecture, exhaust recycling systems, reactors, heat exchangers, medical instruments
- Outdoor applications (e.g. sea climate)
- Also applicable on aluminium and non-ferrous metals.



Stainless steel components with transparent glass coating - anti fingerprint, no staining, no corrosion, antimicrobial if desired



Benefits

- Invisible extremely durable protective coating, which eliminates all disadvantages of stainless steel surfaces without changing the optical appearance and the metallic touch, which is deformable elastically and – in a certain range - also plastically
- Reduction of cleaning effort for stainless steel surfaces
- Coating of three dimensional parts is possible
- Low coating thickness (4 – 8 µm), low material consumption.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

PTFE-free sol-gel coating for food applications



Engineered
nanoProducts
Germany AG

Principle

- Ultra precise spray coating, patent protected technology
- Application possible on any metal surface including sandwich/multi-layer materials
- Single and multilayer coatings for special requests/properties.

Properties

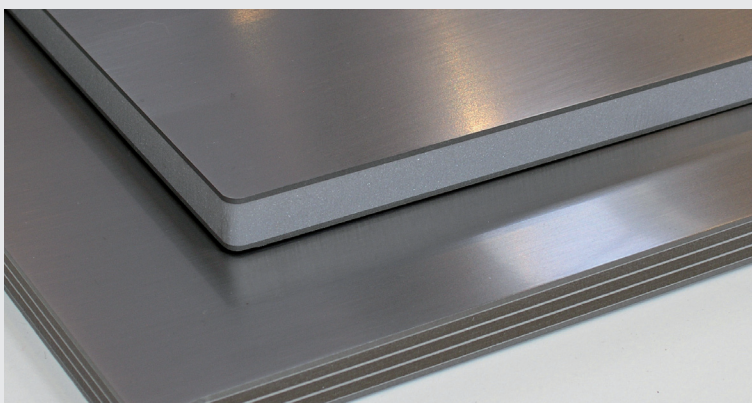
- Easy cleaning compared to metal and enamel surfaces
- Free from Teflon® and other hazardous compounds (e.g. heavy metals)
- Transparent or coloured; special effects by interference pigments e.g. Pearl Gloss®
- High scratch and abrasion resistance
- Much less brittle than classical enamel (elastic deformation).

Benefits

- Long term stability and high end performance
- Environmentally friendly
- Customer approved: Introduced successfully into the market.



Black coated catering containers



*Transparent coated
multi-layer grill plate*

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Antimicrobial Coating on Stainless Steel

Principle

- Integration of antimicrobial nanoparticles into a composite matrix, controlled release mechanism
- Combination with low free surface energies function
- Material palette based on modular principle - Ag nanoparticles which are produced through a nucleation and growth process during the building up of the layer are used as antimicrobial agent
- Size, amount and controlled release of the Ag nanoparticles can be selectively adjusted.

Application Technique

- Wet coating
- Thermal curing

Properties

- Bactericide and fungicide effect
- Optical transparent layers with very good adhesion (primerless)
- Application by commercial coating techniques (spray, flood, dip, printing technique)
- Good chemical stability
- Prevention of adhesion of microbes and contamination on the surface
- Concurrent antimicrobial, fungicide effect (killing of bacteria, fungi and germs).



Easy-to-clean + Ag based controlled release coating

Fields of application

Hospitals, medicine, container for medical solutions, sanitary facilities, food industry, pharmaceutical industry

General options

- High efficiency at low concentration of metal colloids
- Long-lasting antimicrobial effect by controlled release mechanism
- Simple wet chemical application technique material processing on existing production facilities
- Thin film material: low material consumption.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Silver based antimicrobial controlled release coatings

Principle

- Incorporation of antimicrobial nanoparticles, controlled release mechanism
- Excellent antimicrobial effect
- Material palette based on modular principle - Ag nanoparticles as antimicrobial agent produced through a nucleation and growth process during the building up of the layer
- Size, amount and controlled release of the Ag nanoparticles can be selectively adjusted.



*Antimicrobial coated
synthetic leather*

Application

- By wet coating techniques (spray, flood, dip, printing technique)
- Curing technique: thermal curing.

Fields of application

Hospitals, medicine, furniture, container for medical solutions, sanitary facilities, food industry, pharmaceutical industry.

General options

- High efficiency at low concentration of metal colloids
- Long-lasting antimicrobial effect by controlled release mechanism
- Simple wet chemical application technique, material processing on existing production facilities
- Thin film material: low material consumption
- Increase of added value by improved surface quality.

Properties

- Prevention of growing of microbes and bacteria on the surface of furniture, components etc.
- Concurrent antimicrobial, fungicide effect (killing of bacteria, fungi and germs)
- Bactericide and fungicide effect
- Optical transparent layers with very good adhesion on leather (primer-less)
- Gloss and haptic adjustable to the requirements.



Antimicrobial in-ear hearing aids

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Abrasion resistant transparent clear coats on painted surfaces and on stainless steel

Principle

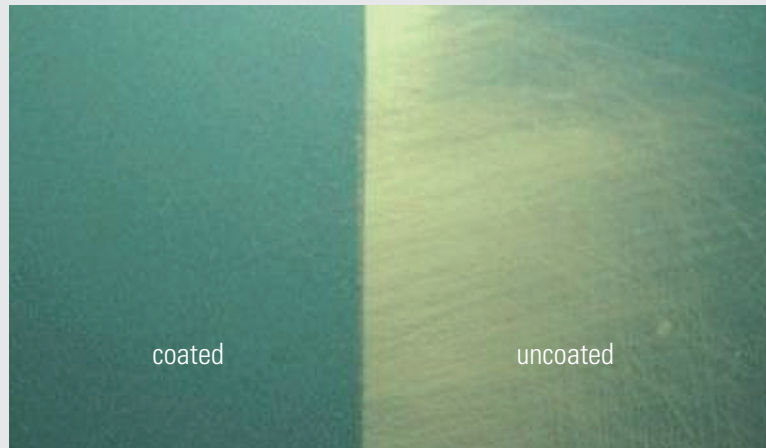
Incorporation of nanoscaled particles in inorganic-organic matrices combined with additional functionalities (UV-protection, easy- to-clean).

Properties

- High scratch and abrasion resistance (Taber Abraser test/1000 cycles: 2-10 % haze)
- Optical transparent coatings
- Excellent adhesion on polymer surfaces
- Application by commercial coating techniques (spray, flood, dip, printing technique)
- Curing technique: thermal curing
- Good chemical stability.

Fields of application

Household, traffic, optics, electronic, processing equipment, decoration.



Stainless steel plate half coated with a scratch resistant clear coat after steel wool scratch test

General options

- Increase of value of component parts (plastics, metals, natural materials) by improved surface quality
- Material application adjustable on existing production plants
- Thin-layer material: low material quantity
- Simple wet chemical application technique
- Thin film material: low material consumption.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Abrasion and chemistry resistant hard coatings for plastic Optional: + antimicrobial



EPG

Engineered
nanoProducts
Germany AG

Principle

Spray coating, thermal densification at 120°C, patent protected technology.

Properties

- High scratch hardness and abrasion resistance.
- Stable against household cleaners, solvents
- Protection against acid attack
- Incorporation of pigments and colouring are possible
- Easy-to-clean function can be incorporated.

Application

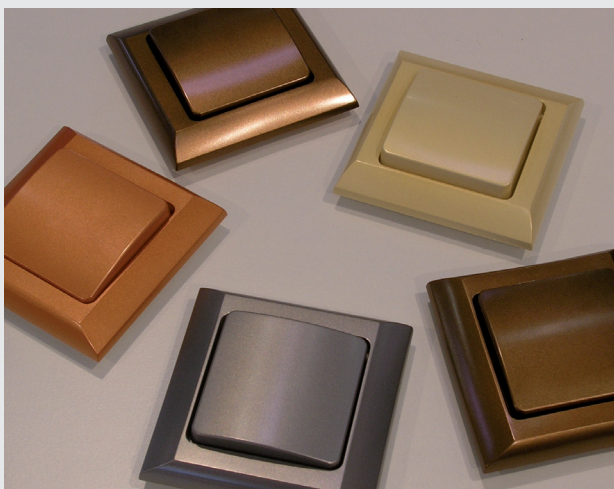
- Electrical switches, wall sockets, dimmers
- All types of plastic surfaces.
- Also on metal surfaces.

Benefits

- Prolongation of lifetime of expensive, decorative installation material
- Protection against chemical attack from cleaners and other aggressive substances.



*Coated switching unit made
from polycarbonate*



Coloured coatings on plastic parts

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

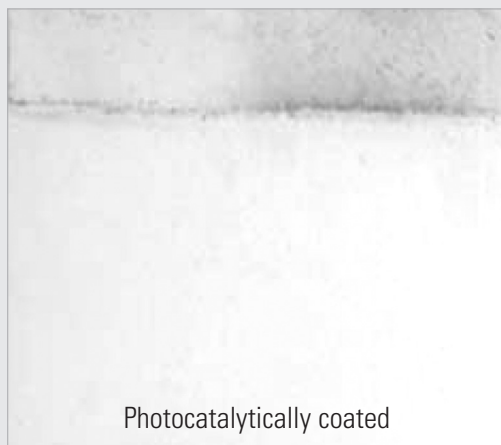
Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

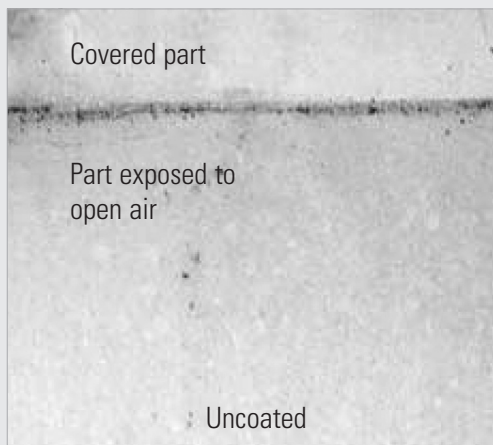
Self cleaning and UV protective coatings on lacquered surfaces



Engineered
nanoProducts
Germany AG



Photocatalytically coated



Covered part

Part exposed to
open air

Uncoated

*Powder coated
aluminum plates
exposed to
environment for
15 months*

Principle

Spray coating, thermal curing at 120 °C (UV curing also possible); self organizing gradient layer formation technology (patent protected)

Properties

- Self cleaning and self sterilizing surface
- Hydrophilic surface formation facilitates easy cleaning by rain or rinsing with water
- Activation by sunlight or artificial UV light
- Long darkness activity
- Long life time
- Protection of the lacquered surface by inorganic gradient formation
- Strongly enhanced UV protection by TiO₂
- Use of visible light photo catalysts possible.

Application

- Façades, window frames, advertisement walls
- All kinds of vehicles
- Traffic signs
- Hospital furniture (with UV light)
- Outdoor appliances.

Benefits

- Strongly reduced cleaning effort
- Self cleaning by rain for remote items
- Enhanced UV protection for the lacquered surface
- Improvement of hygienic conditions

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Controlled reflection screen: Enhanced brightness



Engineered
nanoProducts
Germany AG



*Daylight projection
TV screen, showing
the enhanced
brightness on the
background of a
conventional screen*

Principle

Generation of optical gradient index micro patterns facilitates angle dependent light scattering (patented technology)

Properties

- Widened angle of view
- The screen is reflecting light from the projector but not from the surrounding
- The brightness of the projected image is strongly enhanced
- High mechanical, thermal and chemical durability
- Cost efficient, holographic roll-to-roll technology

Application

Projection of Laser TV, video, DVD, presentations, slight shows

Benefits

- Projection room does not have to be darkened
- Higher comfort for the viewers
- Bright projection also for small projectors

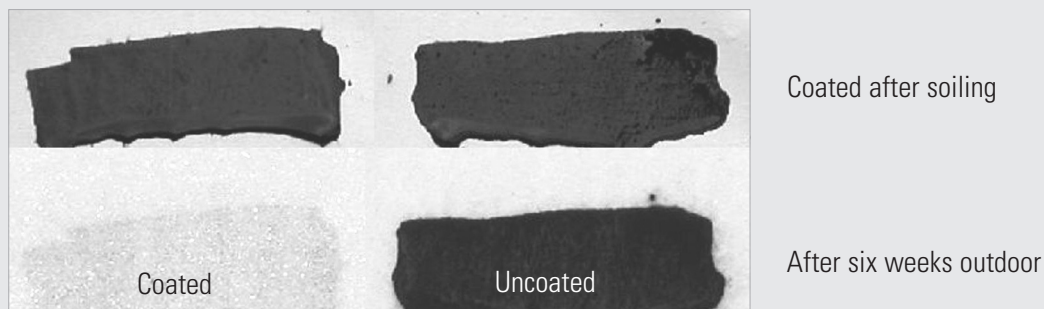
Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Self cleaning and self sterilizing impregnation of textiles for tents



*Differently treated tent materials in comparison:
Self cleaning and self sterilizing impregnation of
textiles for tents with incorporated UV protection*

Principle

Roll-to-roll coating of textiles with a water born system

Properties

- Self cleaning, self sterilizing surface
- Hydrophilic surface facilitates easy cleaning by rain or rinsing with water
- Activation by sunlight
- Long darkness activity
- Long life time
- Substantially increased UV protection of the fabric surface
- Inorganic gradient formation prevents any photocatalytic decay of the textile

Application

- Tents and similar textiles like textile roofs and walls, awnings, binds, marquees
- Flags and banners, sun shades

Benefits

- Self cleaning by rain
- Degradation of stains
- Depression of growth of algae
- Strong UV protection for the lacquered surface
- Improved hygienic conditions

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Automotive: glass coating on stainless steel



*Transparent or pigmented glass coating on
stainless steel exhaust parts*

Principle

Spray coating, thermal densification
at 400 – 600°C, patent protected technology

Application

Decorative exhaust parts for cars and
motor bikes.

Properties

- High scratch hardness and abrasion resistance (IEC test < 150 µm, 500 cycles Scotch Britt sponge without any scratch)
- High temperature tarnish protection (>1000 h at 400 °C)
- Stable against salt (SS test 200 h)
- Anti stick effect against deposits from exhaust gas
- Protection against acid attack
- Incorporation of inorganic pigments and colouring are possible

Benefits

- Reduction of cleaning effort
- Low coating thickness (4 – 8 µm), small material consumption
- Depression of tarnishing colours.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Dishwasher resistant surfaces for cookware



Black pigmented surfaces

Principle

Spray coating, thermal densification at 400°C, patent protected technology

Application

Cookware

Properties

- High scratch hardness and abrasion resistance
- Dishwasher safety
- Stable against food and cleaners

Benefit

- Dishwasher safety of cookware combined with elegant look (hard anodization)
- Protection against chemical attack from cleaners and other aggressive substances.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

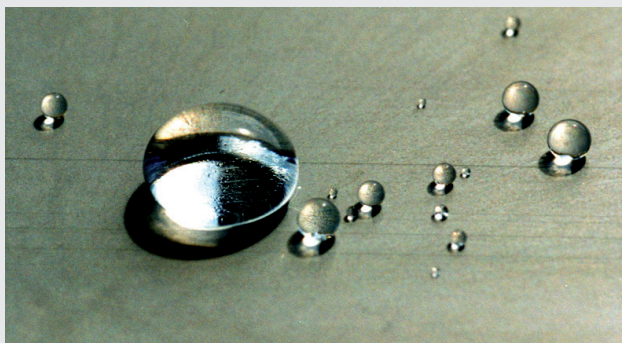
Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Antiadhesive easy-to-clean low surface free energy coatings



Dental application



Principle

Gradient material based on inorganic-organic nanocomposites with various organic poly-matrices through sol-gel and other techniques

Properties

- Surface properties comparable to perfluorinated polymers (surface free energy = 19 mJ/m²)
- Transparent coatings
- High UV-stability
- High scratch and abrasion resistance
- Stability up to 300°C

Application

On ceramic, glass, polymer, textile and metal surfaces by wet chemical coating techniques (spray, flood, dip, printing technique)

Fields of application

Automobile, aerospace, trains, furniture, pipes, printing industry, mold release, food industry, architecture, façades, pavements.

General options

- Variable and adaptable application technology, e.g. to be employed in already existing production lines, facilities, kitchens, etc.
- Detergent and water savings
- Application in form of thin layers possible (1 - 5 µm) reduces the material consumption considerably.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

High temperature inorganic insulation material fabricated

Principle

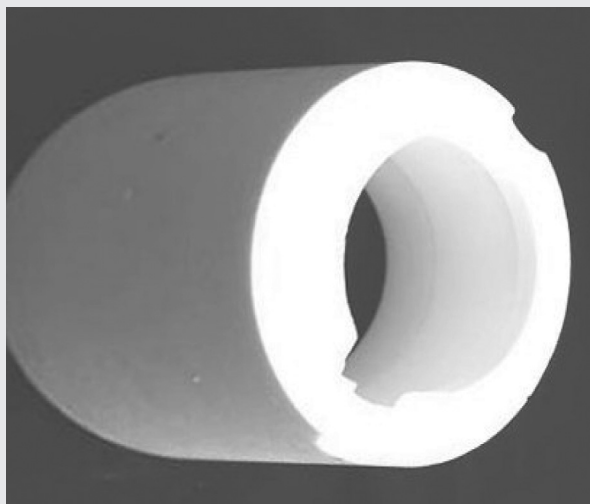
- Mixing of inorganic fillers with a sol-gel binder based on SiO_2 or a hydraulic binder
- Compression and shaping
- Thermal curing or hydraulic hardening.

Properties

- Thermal conductivity = 0,055 W/mK
- Extremely lightweight (density < 1) materials
- Any geometry and surface structure possible
- Heat resistant up to 800°C
- No toxic combustion products during high thermal load
- Recyclable
- Curing technique: thermal curing
- Lightweight high temperature stable insulating materials applicable e.g. by pouring and as "inorganic styrofoam".

Fields of application

- Filling of any cavities in doors, window frames, cable shafts etc.
- "Inorganic styrofoam" sheets
- Branches: Thermal insulation for buildings, engines, pipes, kitchen furnaces.



*Wet molded binder /
porous filler composite part*

General options

- Unique high temperature insulation material
- High flexibility in shaping and mechanical processing
- Mechanical properties adjustable to the requirements of the special application
- Material processing on existing production facilities.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Corrosion resistant, easy gliding, easy to unscrew



Engineered
nanoProducts
Germany AG

Principle

- Dispersion of corrosion inhibiting inorganic components into an inorganic-organic composite matrix
- Formation of a solid lubricant coating by thermal curing.

Properties

- Improvement of corrosion resistance for carbon steels in combination with low friction properties on metals by using an inorganic-organic nano-composite coating
- High corrosion resistance in the salt spray test (e. g. on carbon steel) >2000 h, (DIN 50021/ASTM B 117)
- Low coefficients of friction, in the range of $\mu = 0.05 - 0.15$
- Low sliding wear coefficients, in the range of $k = 2 \cdot 10^{-6} - 5 \cdot 10^{-6} \text{ mm}^3/\text{Nm}$
- Excellent adhesion without primer (GT/TT 0/0).

Application

- By wet coating techniques (spray, flood, dip, printing technique)
- Curing technique: thermal curing

Fields of application

Screws, engine parts, pipes, building elements, (automotive parts, aerospace, trains, furniture, printing industry, mold release, food industry, architecture).



Coated bolt and screw

General options

- Simple wet chemical application technique
- Material processing on existing production facilities
- Thin film material: low material consumption
- Increase of added value of components by improved surface quality.

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

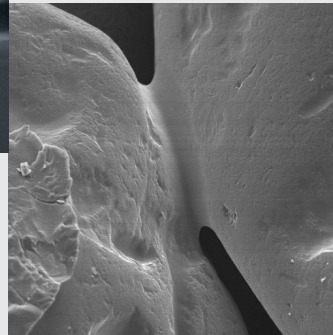
High performance binder for sand, proppants, formations, fibers



Proppant binding

Sand consolidation

Due to the amphiphilic property of Nanoglue, the binding takes place only at the contact points of the pack



*Binder fixes the particles
and can leave the pores*

Principle

- Inorganic backbone produced by sol-gel techniques
- Organic network by radical polymerization „on command“ after application

Properties

- High uniaxial strength (e. g. > 16 MPa for sand)
- High porosity and permeability retention (> 80%)
- Open time can be selected according to the requirements
- Curing temperature can be adjusted according to the requirements
- Application in liquid form
- Chemical resistance tested under hydrothermal conditions with different liquids
- Temperature stability over 150°C

Fields of application

Branches: oil and gas production, water production, environmental industry, foundry industry

General options

- Applicable in oil saturated as well as in water saturated formations
- Adaptable to any specific well and formation conditions easily
- One step process
- Saving of maintenance and recycling costs
- Increase of productivity

Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

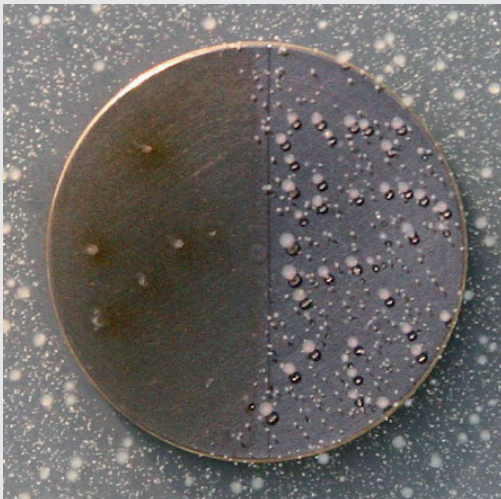
Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de

Coating against Escherichia Coli and Staphylococcus Aureus

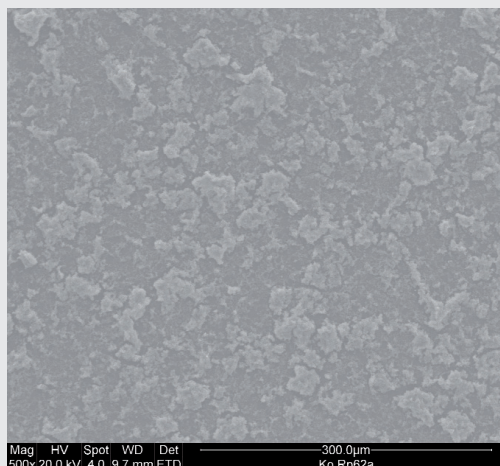
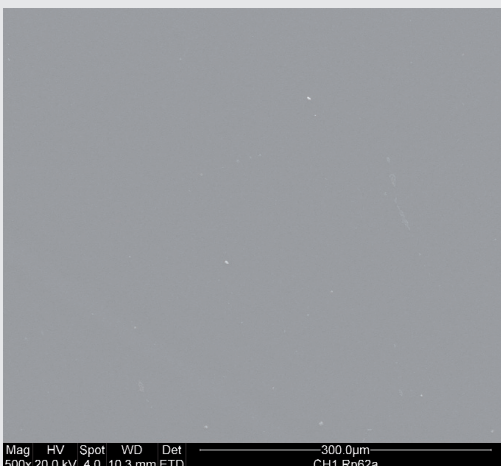
*“On computer keyboards were 400-times more bacteria found,
compared to regularly cleaned public restrooms”*

University of Arizona, 2007



***Nanomedio® coated and uncoated
steel, tested against Escherichia Coli***

***Nanomedio® coated and uncoated
polycarbonate, tested against
Staphylococcus Aureus***



Engineered
nanoProducts
Germany AG

Goethestraße 30
64347 Griesheim
Germany

Tel: +49 (0)6332 48192-0
Fax: +49 (0)6332 48192-44
E-Mail: email@e-p-g.de

www.e-p-g.de