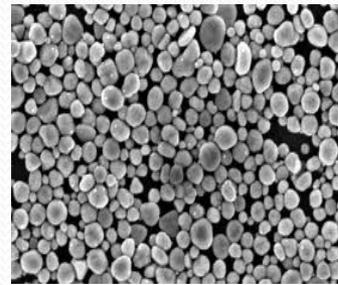


Reinste
Nano Ventures

designed to deliver the purest...

Nanosilver in Footwear Industry

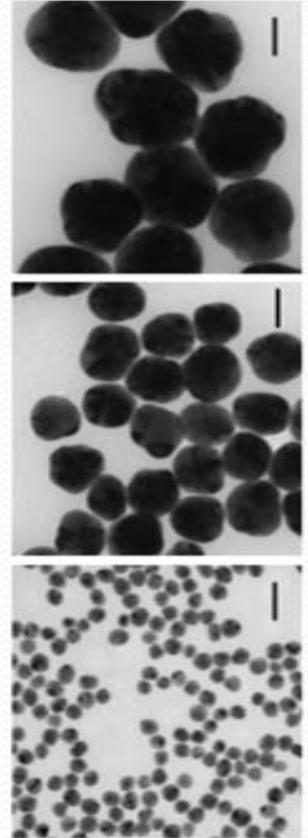


Partnering



What are Silver Nanoparticles?

- **Silver Nanoparticles** are nanoparticles of silver, i.e. silver particles of between 1 nm and 100 nm in size.
- Uniform silver nano particles can be obtained through the reduction of silver ions by ethanol at a temperature of 80°C to 100°C under atmospheric conditions
- The term “Nanosilver” refers to microscopic "nanoparticles" of silver (they're only a few ten-thousandths of the diameter of a human hair), which over recent years have been used increasingly in odor-destroying products including air fresheners, food storage containers, shoe liners and even washing machines.
- Nano Silver is high efficacious and got the power to produce an intended effect



Benefits of Nanosilver in Footwear

Odorless & Antibacterial:

Odor-free footwears are healthier and so much more pleasant to wear. Reinste Nano Silver provides Antifungal, Antibacterial and Antimicrobial properties to our footwears.

Safe on the Skin:

It is safe for the human body. It does not cause allergic reactions and contains no harmful material for the human body.

Safe for the Environment:

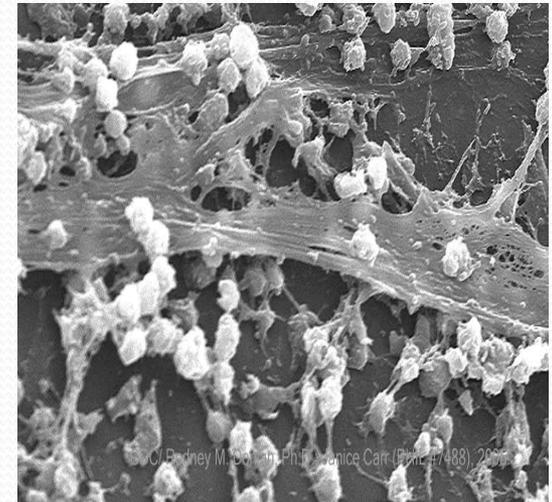
This environmentally- friendly fiber causes no water pollution, for the anti-microbial substance rarely dissolves in water when dyed or washed.

Long Lasting & Durable Function:

Since the anti-microbial substance is mixed into the polymer, its function is durable throughout the lifetime of the footwear.

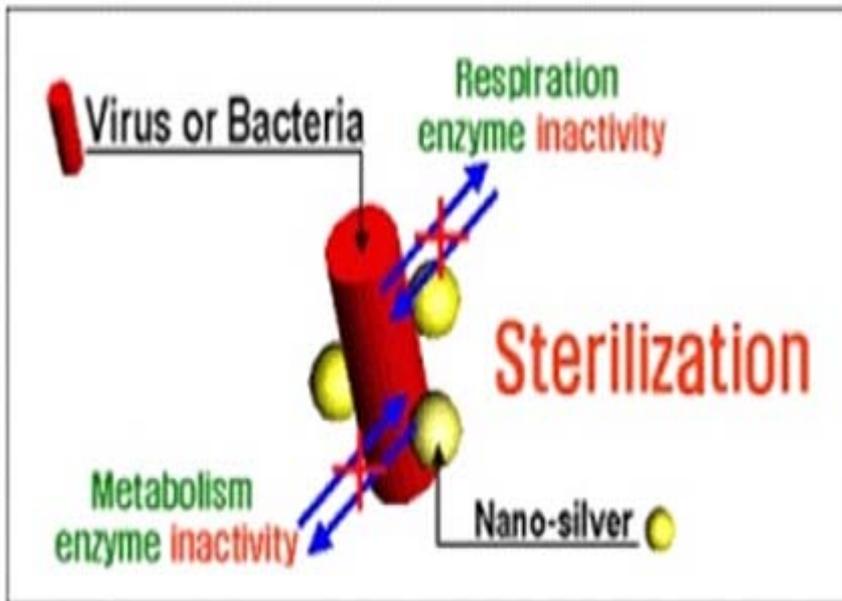
Common Problems in shoe industry

- **Excessive bacterial growth**
- ❖ Many surfaces promote the growth of microbes
- **Bacterial strategy: Biofilm creation**
- ❖ In most cases bacteria creates a biofilm.
- ❖ Just a few bacteria are sufficient to initiate the formation of a biofilm
- ❖ Inside the biofilm microbes are protected against immune defense and antibiotic treatment
- **Generation of adverse odors**
- ❖ Bacteria grow exponentially
- ❖ Number of bacteria exceed a certain value
- ❖ Noticeable Excretion of metabolic products and smelly substances like **Hydrogen sulfide (H₂S), Methanethiol (CH₄S) Methylisoborneol, Butyric Acid**
- ❖ Growth of bacteria and biofilm creation has to be avoided by expensive cleaning and hygiene procedures



How it Works?

Silver has been used for the treatment of medical applications for over 100 years due to its natural antibacterial and antifungal properties. With the increase in concern about foot health, Reinste Nano Silver enhanced footwear offers clear consumer advantages.



When feet perspire, bacteria thrive in the damp fibers and where bacteria thrive, odor thrives too. When Nano Silver contacts with bacteria and fungi, they adversely affect cellular metabolism and inhibit cell growth and they finally kill them to almost 100%.

Footwear Parts & Nano Silver Applications

Shoe Insoles:

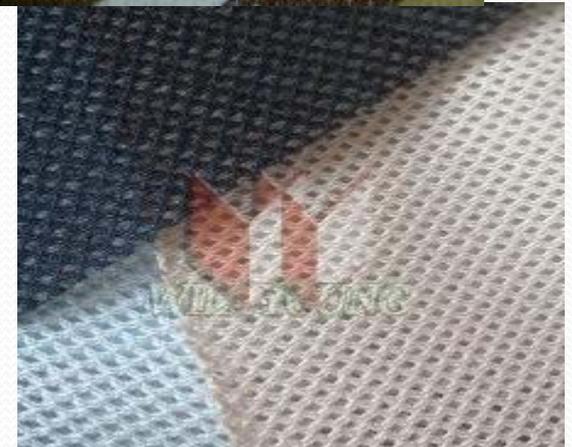
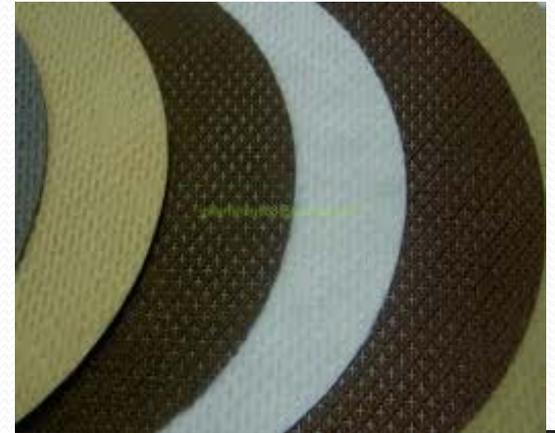
- As the health of feet depends on the shoes, experts are making the best functional insole using Nanosilver with the basis of well-balanced management in health and function.
- The product is essential for the health of foot and the elimination of foot smell, as it keeps the shoe pleasant and dried, by absorbing the shock on knee in walking and injecting fresh air of 35cc between toes where foot smell and athlete's foot lies.



Shoe Linings

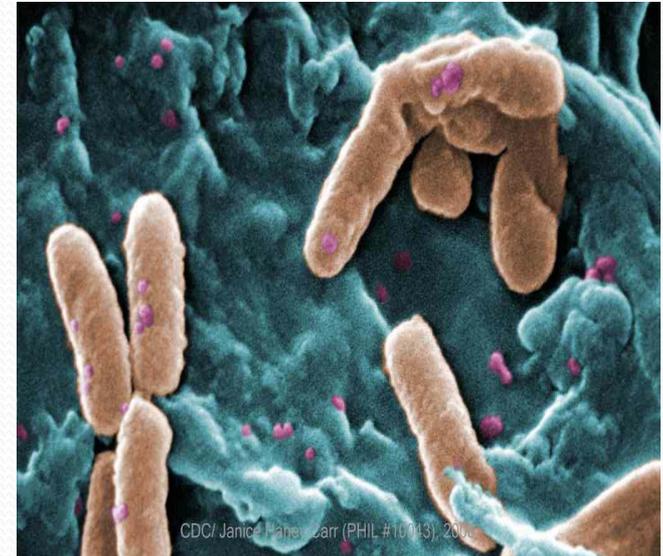
The lining of a shoe is the inside material that touches the sides of the foot, the top of the foot, and/or the back of the heel. The main purpose of a lining is to cover the inside seams of a shoe, but linings made of special materials also tout comfort features such as additional padding, or the ability to pull moisture away from the foot.

Nanosilver Masterbatches and Nanosilver embedded Yarn can be used for Shoe Linings.



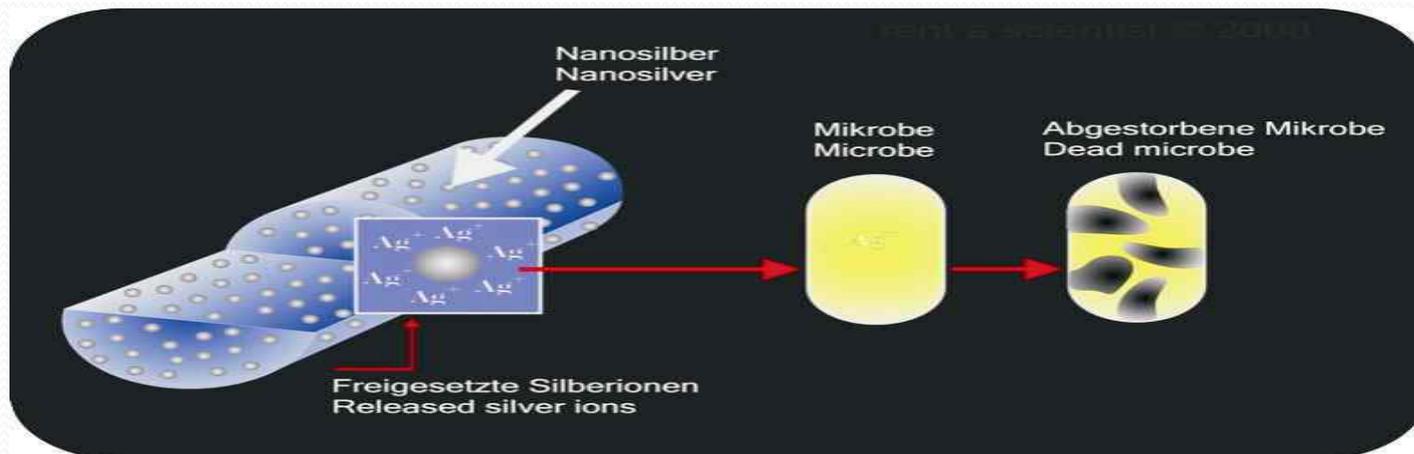
Solution to the problems in shoe Industry- AgPURE

- Stated aim
 - ❖ Preventing the initial adhesion of biofilm forming microbes.
 - ❖ Avoiding the proliferation of pathogenic germs on the relevant surface.
 - ❖ Adding of an antimicrobial agent to the material either directly during manufacturing or with a special coating procedure.



AgPURE Properties

- **AgPURE™: Controlled release**
 - ❖ Nano silver continuously releases silver ions.
 - ❖ Steady state silver ion concentration
- **Constant antimicrobial activity**
 - ❖ Irreversibly bound as a physical part of the material.
 - ❖ Antimicrobial efficient over time, even when the product is exposed to UV-light and cleaning procedures.



AgPURE Properties

- Antimicrobial effect of AgPURE™
- ❖ Very high antimicrobial efficacy with very small potential side effects
- ❖ Prevents biofilm formation and the exponential growth of bacteria
- **no adverse odors**
- ❖ Active even against mold and other fungi
- ❖ Removing 99,9 % of all bacterial cells on a surface within one hour, depending on the dosage

AgPURE Properties

- **AgPURE™: Easy to use**
 - ❖ Free of any fillers
 - ❖ Homogenous particle distribution
 - ❖ Processable and stable at high temperatures ($> 300^{\circ}\text{C}$)
- **AgPURE™: Economic**
 - ❖ 1/100 of the normal silver dosage needed
 - ❖ Less than 1 g AgPURE™ nano silver per kg material (0.1 %) are sufficient for a high antimicrobial efficacy
 - ❖ Smart production process of AgPURE™: one of the cheapest silver additives on the market

AgPURE - Safe to human tissue

- ❖ No abrasion of nano silver particles is detectable from polymer materials .
- ❖ AgPURE™ containing microfiber cloth: No irritations on the skin of the test persons even those having atopic eczema
- ❖ No Cytotoxic effects in different human cell lines, when using the optimal antimicrobial efficient dosage. (ISO 10993)
- ❖ AgPURE™ nano silver causes no sensitization to the laboratory animals (according to Local Lymph Node Assay – LLNA)

AgPURE - Antimicrobial Testing

Proven efficacy of AgPURE™

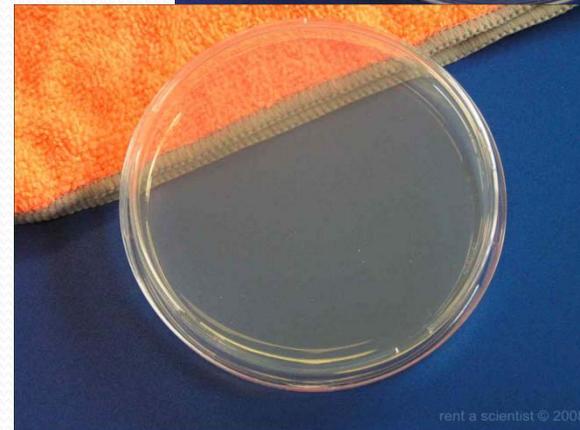
- ❖ Agar diffusion test is not suitable
- ❖ Antimicrobial efficacy verified and certified by in-house microbiology methods according to international standards:

- **JIS Z 2801:2000,**
DIN EN ISO 20743:2007-10

- **JIS L 1902:2002,**
ISO 22196:2007

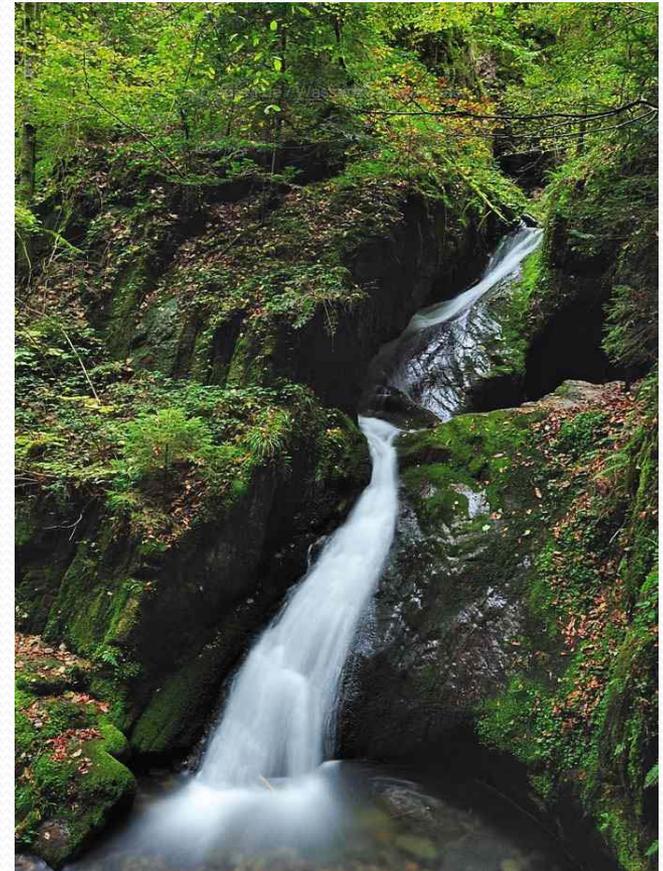
- **SN 195921, ASTM G 21 – 96,**
JIS Z 2911:1992

- ❖ Certification of antimicrobial products



AgPURE - Safe to the Environment

- Ecology - Enhanced sustainability with NANOMATERIALS
- ❖ Silver replaces organic chlorine-containing biocides
- ❖ Nanotechnology: Comparable efficacy , significantly decreased material input.
- Lower amounts of Silver have to be
 - Mined
 - Transported
 - Manufactured
 - Consumed
 - Recycled
- Conserve resources with Nanotechnology



Nanosilver Forms that can be Used in Footwear Parts

We are providing Nano Silver in the following three forms that can be easily mixed with raw material of Footwears while manufacturing.

➤ *Liquid Nano Silver (Aqueous dispersion of colloidal silver)*

This Liquid Nano Silver is having the particle size of 15 nm and is totally miscible in water. Color is orange brown and is practically odorless. Liquid Nano Silver can be used as an additive in any water based coatings. Footwear insole can be coated with these kinds of coatings for production of safe and odorless soles. These Nano Silver particles can also be embedded in the insole using provided technology to get antimicrobial and antibacterial properties.



➤ *Nano Silver PET & PP Master Batches*

Nano silver master batch is developed in order to get antimicrobial property in various footwear industry products, particularly for fibres which are produced by melting mono as well as multifilament fibres and are used in side walls of footwear. This PET Master Batch can be used as an additive in the material for the side walls (lining) of footwears.

With the products of Reinste, it is possible for your shoe fiber to be durable and anti-equip all. Bacteria prefer to keep in a moist environment in which they can reproduce the best. This environment can be found frequently in our footwears and these nano silver product helps to clean them.

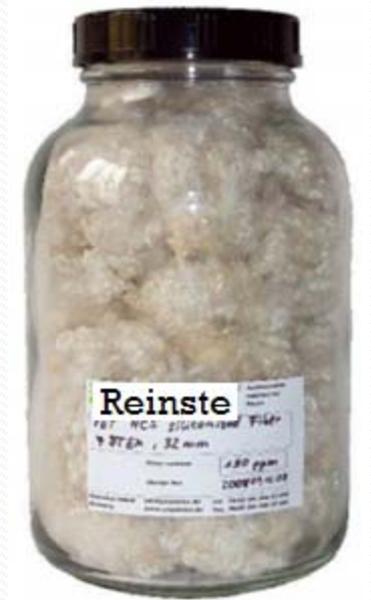


➤ *Nano Silver Polyamide 6 (PA 6) Master Batch*

Antimicrobial finishing of staple fibres from polyamide 6 by melt spinning. This is another polymer master batch which can be used for manufacturing technical fabrics for footwear.

➤ *Nano Silver Embedded Yarn*

Nanosilver embedded yarns can be directly used for making Shoe lining fabrics.



Liquid Nano Silver

Material	Min. order amount	Technical data	Safety data	Description
Si Li W10	0.5 Kg	available	available	liquid, water based Nano-Silver, content 100.000 ppm = 10 %
Si Li W25	0.5 Kg	available	available	liquid, water based Nano-Silver, content 250.000 ppm = 25 %
Si Li W x	0.5 Kg	available	available	liquid, water based Nano-Silver, content depending on customers request, up to approx. 50 %

can be mixed with any water based liquid and many other liquids.

Fibers and Yarns

Material	Min. order amount	Technical data	Description
Staple fibers			
Si PET stapel fiber C 400	1 bale (approx. 270 kg)	available	PET Staple fiber, 1,5 Dtex, 38 mm, 400 ppm for common blendings, e.g. cotton
Si PET HCS staple fiber M 200	1 ton	available	PET Staple fiber, 1,15 Dtex, 38 mm, 200 ppm, for various applications
Si PET HCS staple fiber 7/si 200	1 ton	available	PET Staple fiber, 7 Dtex, 32 mm, 200 ppm, siliconized for fillings

Fibers and Yarns : **Filament fibers and yarn**

Material	Min. order amount	Technical data	Description
Si PET fil. fiber 200	1 ton	available	PET multi filament fibers, various Dtex e.g 80D/100F, (POY, DTY, FOY) 200 ppm, for fabrics and knitware
Si PET/PA fil. Fiber 200	1 ton	available	PET/PA compund 70/30 multi filament fibers, various Dtex, 200 ppm for fabrics and knitware
Si PET/COT Yarn 200	1 ton	available	PET/COT blended Yarn Nm 50/2 (=200(2)Dtex), 200 ppm for fabrics and knitware
Si PA mon fil. fiber 200	1 ton	available	PA mono filament fiber, various Dtex, 200 ppm

Fabric and Fleece

Material	min. order amount	technical data	Description
Fleece			
PET fleece	On request	available	PET fleece, various possibilities
PET/PA fleece	On request	available	PET/PA fleece, various possibilities, e.g. 30 gsm
PP fleece	On request	available	PP fleece, various possibilities
PP/COT fleece	On request	available	PP/COT 50/50 fleece, various possibilities

Silver content can be adjusted on request .T/C fabric 40/60 Twill, 160 ppm, un-dyed or dyed.

Polymer range and specifications can be adjusted on request, delivery times will be accordingly.

AgPURE - Quality

➤ **Quality assurance**

- ❖ Quality policies of ras materials meet the requirements of medical device production
- ❖ Certification in accordance with DIN EN ISO 13485:2010 Regulation in progress

➤ **EU-Biocides Directive (98/8/EC)**

- AgPURE is a registered biocidal product within the biocide regulation
- AgPURE™ is used as a biocide
- Registration of treated products under REACH can be omitted

➤ **International standard reference material**

- AgPURE™: selected as one of the official reference- and testing material for the “sponsorship program” of the “Organisation of Economic Cooperation and Development”



Thank You



Reinste Nano Ventures

Designed to deliver the purest...

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