

QUALITY PROTECTS.



Silvadur™ Technology

Advanced antimicrobial protection and freshness solution for Textiles

SILVADUR™

QUALITY WORKS.

LANXESS
Energizing Chemistry

SILVADUR™ PROVIDES UNMATCHED ANTIMICROBIAL PROTECTION AND FRESHNESS

SILVADUR™

Silvadur™ is multifunctional

■ Antimicrobial protection:

Through its antimicrobial mode of action, **Silvadur™** reduces harmful bacteria while ensuring hygiene.



■ Odor control:

Silvadur™ provides ultimate freshness by preventing odors before they even start.



■ Wash durability:

Freshness and Hygiene provided by **Silvadur™** are very long-lasting, remaining even after multiple wash cycles.



Silvadur™ delivers “intelligent” microbial control technology

- Using a patented, controlled-release technology, **Silvadur™** delivers a low concentration of silver ions to fabric surfaces to control malodor-generating bacteria and substantially reduce waste.
- The revolutionary technology contained in **Silvadur™** is the world's first and only aqueous-base-silver-polymer delivery system.
- Provided **Silvadur™** is used per guideline and as recommended, it has been assessed to be harmless to human health as well as allowing production with a minimum impact on people and the environment. This has been proven and certified by the International Oeko-Text Association as well as bluesign®.

Silvadur™ provides three modes of action

- **Antimicrobial control:**
Smart Release controlled delivery system uses very low levels of silver (e.g. 20 ppm silver ion) to control odor-causing microorganisms.
- **Odor absorption control:**
Blocks selected odorants via absorption.
- **Control of metabolic enzymes:**
Silvadur™ silver ion denatures and inactivates protein, preventing production of malodors like isovaleric acid (common component of foot and armpit odor).

SILVADUR™ SUPPORTS SUSTAINABILITY BY REDUCING THE NEED FOR FREQUENT WASHING

SILVADUR™

Leading to significant savings in water and energy

In the MILL

- **Silvadur™** chemistry delivers a low concentration of silver ions bound in patented polymer technology.
- **Silvadur™** delivers processing efficiencies: it disperses easily and homogeneously on fabric surfaces with a high pick-up rate.
- **Silvadur™** requires no to minimum heat and less application time without the addition of binders.
- **Silvadur™** complies with US EPA PPE & EU BPR requirements: Recommended application dosages are below authority-accepted mill workers exposure levels of concern.
- **Silvadur™** is recyclable when used during typical textile processing: Some of the silver ion may be retained in the process water and can be reused under certain considerations at the mill.

At HOME

- **Silvadur™** odor and freshness protection lasts a minimum of 40 home launderings (at 30 ppm dosage).
- **Silvadur™** protects fabrics from degradation and prolongs the life of the treated textile.
- Less frequent launderings save energy and water usage, time and money. Regular laundering practices do not degrade the polymer technology.
- **Silvadur™** prevents bacterial growth even in cooler washing temperatures. Washing in cold water saves energy and reduces CO₂ emissions.
- **Silvadur™** is kind to humans and pets: Fabrics treated with **Silvadur™** at the indicated levels have been found to be neither irritating nor sensitizing, based on independent clinical studies using 5-6 times of actual dosage level.

In the ENVIRONMENT

- **Silvadur™** poses no environmental threat during laundering: While some **Silvadur™** may be released during laundering, the silver ions are converted into benign species which do not impact the environment.
- **Silvadur™** treated textiles pose no environmental threat once they reach the landfill. After the useful life of the treated textiles, any remaining trace amounts of **Silvadur™** in the environment meet Biocidal Product Regulations established in Europe and US EPA.



SILVADUR™ DELIVERS SUPPLY CHAIN EXCELLENCE PERFORMANCE AT EVERY STEP

SILVADUR™

Intelligent performance along the entire supply chain

Brand owners and retailers can design products that feature truly intelligent freshness, enabling them to remain active for multiple washings. Consumers can feel confident knowing their garments provide intelligent freshness protection that won't harm them or the environment.

Ultimate Ease of Use

Silvadur™ is the 'gold standard' for ease of use, efficacy and durability. With its polymeric properties, low dosage profile and its solution formulation composition, Silvadur™ is widely chosen to replace particles based silver chloride or Zinc Pyrithione, and Quat-silane based technologies.



APPLICATION VERSATILITY

Silvadur™ can be applied easily using almost any method...

Silvadur™ offers many benefits. It

- can be applied easily using spray, pad & exhaustion process
- is applicable to natural & synthetic fibers
- is thermally stable at most standard application temperatures used in the mill
- presents a fast & efficient exhaustion



...and at any step in the process



Yarn Production



Fabric Finishing



Fiber & Fiber Fill Production



Nonwovens



Garment Production



Fabric Production

SUPERIOR SILVER ION TECHNOLOGY

SILVADUR™

Silvadur™ vs. Silver Chloride and Particle Based Systems

- Traditional silver-based antimicrobials deliver silver particles to the fabric surface and rely on silver particle leaching or slow dissolution of poorly-soluble silver salts to control bacteria.
- Silver particulate size and the indiscriminate release of silver can cause discoloration and reduced antimicrobial performance over time. In addition, the particulates can cause a non-uniform antimicrobial finish during the manufacturing process, leading to higher cost-to-treat and poor quality.

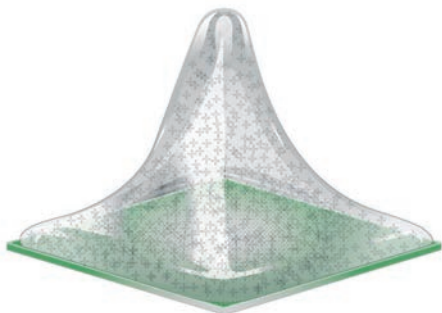
Silvadur™ vs. Silver Nanotechnology

- Silvadur™'s fully-soluble polymer system delivers silver ion – not metal silver – to the treated fabric surface for a uniform coating.
- Silvadur™'s Smart Release system allows the use of very low levels of silver ion, thereby reducing silver waste potential.
- Nano particle-based silver products rely on silver metal particles that do not easily dissolve in water, providing a less-than uniform finish.

Silvadur™ vs. Polymeric Quat Systems (Quat Silanes)

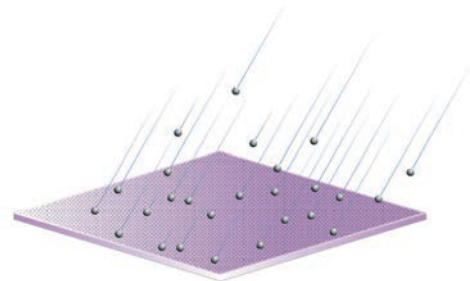
- Fabrics treated with Silvadur™ require less heat and less time without extra binders or added steps during the application process.
- Quat Silanes can be difficult to control, requiring careful dilution, formulation and processing conditions.
- Quat Silane treated fabrics can become water repellent which requires more chemicals and costs to control hydrophobicity for customers requiring moisture management capabilities.

Application



Silvadur™

Delivers an aqueous polymeric matrix over the entire textile for complete, even distribution of the silver ion chemistry.



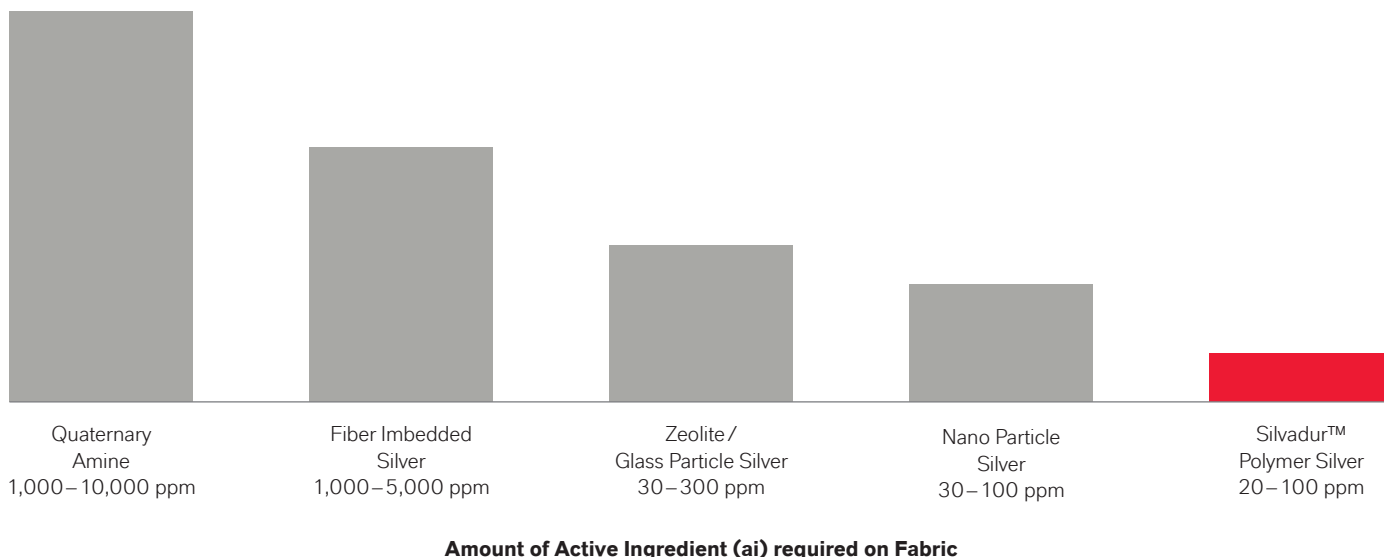
The Others

Particulate-based technologies such as nanoparticles, salts or crystals sit on top of the treated fabric surface.

SILVADUR™ DELIVERS UNMATCHED EFFICACY & DURABILITY

SILVADUR™

Silvadur™ optimizes antimicrobial efficacy and delivery for reliable and durable performance



Silvadur™ demonstrates significant bacterial reduction

Test Method: AATCC 100; 1:20 NB in sterile distilled water + 0.05% Triton X-100 wetting agent; 24 hour contact, 1.0 g sample; 1000ul inoculum; 10ml D/E neutralizing broth; EMB agar; Mannitol Salts agar 1000 ul inoculum; 10 ml D/E neutralizing broth; EMB agar; Mannitol Salts agar

Test Organisms	Staphylococcus aureus (ATCC 6538) Klebsiella pneumoniae (ATCC 4352)	
Concentration of inoculum (cells/ml)	S. aureus 1.88E+05	K. pneumoniae 1.99E+05
Method Used to Measure Living Bacteria	Pour plate method	
Sample Material	100% Polyester	

	S. aureus Percent Reduction from Supplied Control		K. pneumoniae Percent Reduction from Supplied Control	
	Initial	50x	Initial	50x
Untreated	–	–	–	–
Silvadur™ treated	>99%	99.9%	>99%	>99%

OUTSTANDING ANTIMICROBIAL PROTECTION

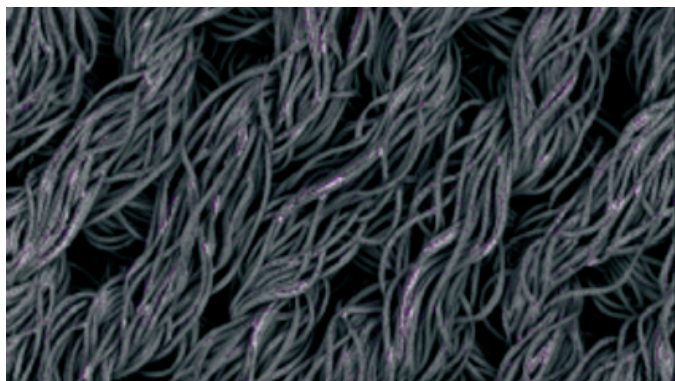
The Silvadur™ Advantage vs. Traditional Antimicrobial Technologies

	Silvadur™	Other Silver Particle Based Technologies	Quat Silanes	Zinc Pyrithione (ZPT)
Delivery System	An organic polymer-based system utilizing a patented release technology.	Inorganic supported system that releases silver laced particles in the presence of water and ions.	Application can be difficult to control.	Dispersion or powder. Sometimes requires equipment clean-up after textile processing.
Wash Durability of Finish	Excellent durability as organic polymer system adheres to fiber.	<ul style="list-style-type: none"> ■ Low to medium durability ■ Inorganic matrix has no attraction for the fiber surface ■ Needs binder to increase durability 	<ul style="list-style-type: none"> ■ Antimicrobial performance lost upon use ■ Surface changes are neutralized upon washing ■ May require binders 	<ul style="list-style-type: none"> ■ Requires binders on cotton ■ Does not have broad antimicrobial performance at concentrations below 1000 ppm typically ■ Pseudomonas can survive
Effects on Fabric Look and Feel	No effect or slight increase in hydrophilicity.	Might change feel of fabric due to binder system.	Makes fabric hydrophobic due to the presence of long carbon chains.	May cause loss of color in synthetic fibers and fabrics.
Color Stability	Colorfastness maintained.	<ul style="list-style-type: none"> ■ Depending upon use level, yellowing or discoloration of white fabrics sometimes observed ■ Shade shift occurs with overtreatment ■ Potential interferences with ionic dye systems 	<ul style="list-style-type: none"> ■ Depending upon use level, yellowing or discoloration of white fabrics sometimes observed ■ Shade shift occurs with overtreatment ■ Potential interferences with ionic dye systems 	Depending upon use level, yellowing or discoloration of white fabrics sometimes observed.

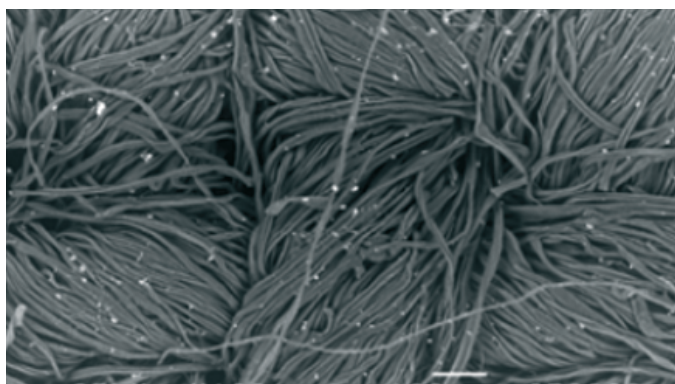
THE FUTURE OF FRESHNESS IS HERE

Typical particle technologies deliver non-uniform treatment on fabric surfaces, thus leaving voids in treatment and protection.

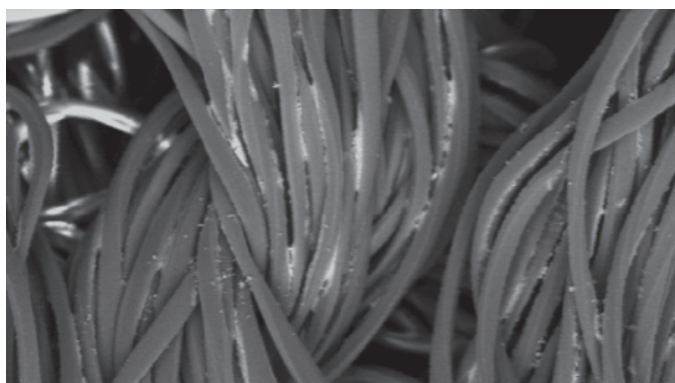
Silvadur™ delivers uniform treatment



Typical particle technologies deliver non-uniform treatment



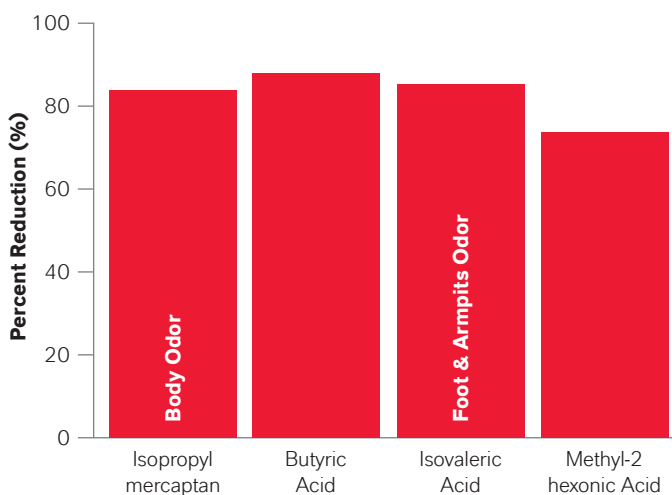
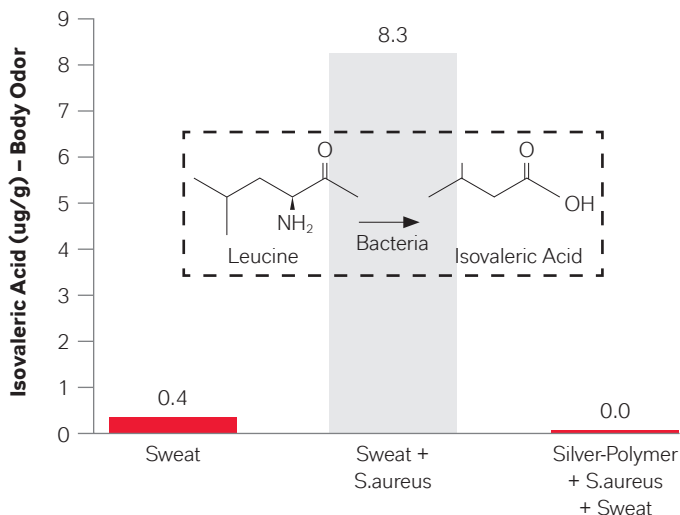
Example of uneven distribution of Zinc Pyrithione on polyester fibers



Silvadur™ Delivers Effective & Reliable Odor Control in Textiles

Odor is a growing concern in apparel and textile applications due to laundering limitations managing odor causing microorganisms and the odorants they produce. Key contributors to textile odor include combinations of microorganisms, human sweat, and urine.

Silvadur™ Reduces Common & Problematic Malodors In Textiles



GLOBALY ESTABLISHED AND WIDELY PROVEN TECHNOLOGY

SILVADUR™

International OEKO-TEX® Association

- **Silvadur™** is recognized and listed as an Active Chemical Product (with biological activity) by the International OEKO-TEX® Association as a formulation that has been assessed to be harmless to human health, provided it is used as indicated and designated.

A bluesign® Approved Chemical Product

- Complies with the strict ecological and toxicological requirements when applied to the treated fabric
- Properly applied it allows production with a minimum impact on people and the environment
- Basis for bluesign® approved textiles and accessories

bluesign®
APPROVED

A bluesign® System Partner

Silvadur™ is committed to applying the bluesign® system by:

- Being a responsibly acting party of the textile supply chain
- Continuously improving environmental performance
- Focusing on a sustainable future

Silvadur™ Meets ZDHC MRLS Conformance Level 3

- Highest level of ZDHC conformance
- **Silvadur™** does not contain MRSL banned chemicals
- Showcases LANXESS's commitment to product stewardship, environmental health & safety leadership

Ø ZDHC







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SILVADUR™

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information.

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Note: The information contained in this publication is current as of April 2025. Please contact LANXESS to determine if this publication has been revised.

Use biocides safely. Always read the label and product information before use.