

PRODUCT DESCRIPTION

FUZE is an HDA (high density allotrope) non-ionic silver textile finish designed to eliminate microbial activity over the life of a variety of fabric types. It can be applied using pad application during the textile manufacturing process. FUZE is a broad-spectrum textile finish comprised of a high density, non-ionic allotrope of silver for optimal efficacy using extremely low dosage and high wash durability. It does not require any additional binder or curing. FUZE can be used as dilution for other water-based textile application.

When properly applied, FUZE does not negatively impact fabric hand or shade at any application level. Prior to commercial implementation, the user should always evaluate the suitability of FUZE for formulation with current application to their specific material.

PRODUCT CHARACTERISTICS

Product Form	Clear, transparent, yellow in color water formulation
pH (@ 20°C)	6.998 (manufactured ultra-pure water at 18.18 MΩ.cm)
Useable pH Range	3 – 8
Specific Gravity (@ 20°C)	1.03 – 1.05 g/cm ³
Conductivity	< .055 mS/cm
% Solids	.003 +/- 0.3% (by weight)
% Active (HDA)	.003 +/- 0.3% (by weight)
% Silver	.003 +/- 0.3% (by weight)
Chemical Composition (particles)	.003 +/- 0.3% (by weight) Ag
Ionic Characteristics	Non-ionic

TEXTILE APPLICATIONS

Household textiles (bedding, mattress cover pads and filling, pillow covers, sheets, blankets, fiberfill for quilts and pillows, napkins, wiping cloths, non-woven general purpose cleaning cloth, mops, towels, bags, cushion pads; sleeping bags, brush bristles, filters, sponges), carpet backing, automotive and industrial textiles (conveyor belts (nonfood contact), packaging, automotive and truck upholstery, automotive and truck carpeting, truck liners convertible tops and interior liners), apparel (outerwear, uniforms, coats, aprons, sportswear, sleepwear, stockings, socks, hosiery, caps, undergarments, inner liners for jackets, shoes, gloves and helmets), home decorations (book covers, curtains, draperies, upholstery, wall covering fabrics), outdoor fabrics (sails, ropes, tents, tarps, canvas, ducking, awnings, umbrellas). Do not use this product to treat materials intended for food-contact uses.

STORAGE RECOMMENDATIONS

The water dispersion is stable for a minimum of 2 years when unopened and stored in conditions above freezing. It is best to not store directly on the ground. Differences in temperature gradient from the ground to the air may cause higher concentrations at the bottom of the storage container. Storage in direct sunlight in UV rays will affect the color but not the performance of the product. Product can be recertified for concentration by ICP analysis.

SHELF LIFE

24 months (note: Total shelf life can be longer if not opened or contaminated and properly stored. Product can be certified for use at any time with proper ICP analysis.)

RECOMMENDATIONS FOR PAD APPLICATION

UPPER LIMIT

3.0 mg
per kg of fabric

LOWER LIMIT

0.003 mg
per kg of fabric

In order to achieve desired durability and performance and to avoid discoloration:

- Use water with a hardness of ≤ 100 ppm. FUZE will bind to hard water deposits and clean the water reducing antimicrobial efficacy on textiles.
- FUZE does not require heat for curing or setting. Longer soak times after bath before drying will improve FUZE binding to fibers and reduce usage for maximum efficacy. Water is the carrying agent, FUZE will deposit higher concentrations at the last point of drying or evaporation. Air drying is not recommended.
- FUZE is a diluting agent of water, when using other finishing agents, FUZE usage will contribute as a percentage of the dilution required for other finishing as final components of the bath.
- FUZE will bind to other finishing agents. When applied to fibers directly in greige, greater durability can be achieved with lower usage.
- Where possible avoid using the following chemistries in combination with FUZE:
 - > Unfixed sulfur dyes or products with high sulfur content. Sulfur is highly attracted to FUZE and will coat FUZE reducing antimicrobial efficacy.
 - > Enzymes or natural proteins
- Ensure the fabric is sufficiently rinsed prior to addition to the finishing bath.

Specifics of application dosage and other parameters vary per material. To arrive at optimal parameters one or two bulk trials are recommended with ICP testing for collaborative data.

MIXING AND APPLICATION INSTRUCTIONS

- 1 Ensure that FUZE is shaken before use.
- 2 Water used for bath should be 5 – 45°C.
- 3 Dilution prior to use is recommended to use ultra-pure water or distilled water.
- 4 Recommendation: Add FUZE directly to tub, when possible, instead of the stirring, mixing, or batching tank.
- 5 FUZE will quickly attach to steel, steel pipes, galvanized or stainless. It will also quickly attach to poly urethane tubing, PVC piping and other low-grade plastics. If you are using these materials in production. Immediately use product to reduce loss of concentration.
- 6 FUZE representatives are available for review of process and to recommend best procedure and application methods for your system. Ancillary equipment can be supplied by FUZE for assisted delivery and application.
- 7 Compatibility of chemicals with the FUZE must be determined by the user before use.
- 8 FUZE quickly and evenly dilutes. Minimal stirring required if necessary.

PACKAGING & DISPOSAL

PACKAGING

19 kg high density PET1 bottles (cleaned of contaminants)—palletized 16 or 32 (maximum per pallet)

MATERIAL DISPOSAL

All pesticide wastes are considered hazardous by law. Proper disposal of excess pesticide, spray mixture or rinsate is a recommended in accordance with national, state, and local laws in most jurisdictions. If these wastes cannot be disposed of by use according to label instructions:

United States: Contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

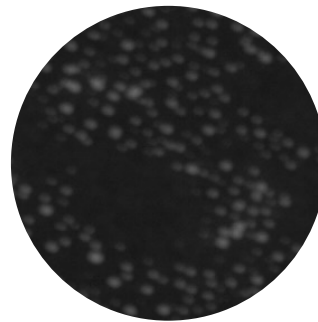
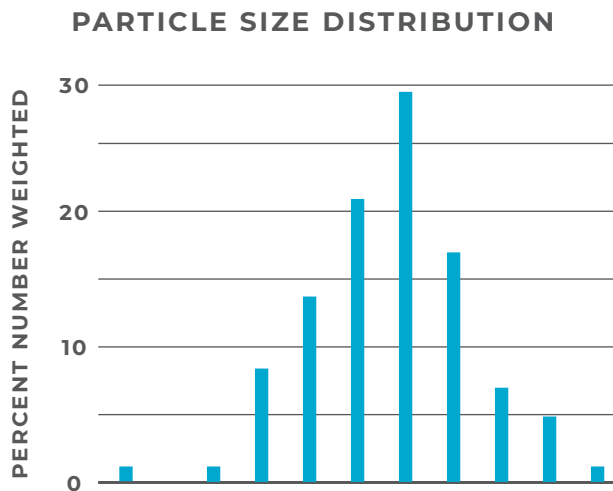
International: Contact the applicable government agency for guidance.

CONTAINER DISPOSAL AND RE-USE

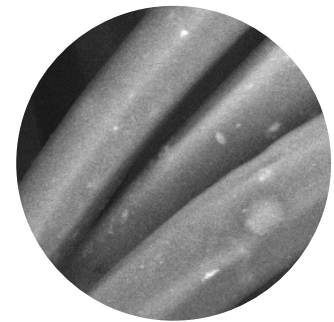
This product comes in refillable containers. Recycle where such services are available. Otherwise, dispose of empty container in a sanitary landfill or by incineration, or if allowed by State and local authorities, by burning. If burned, stay out of smoke.

PARTICLE SIZE & DISTRIBUTION

Mean number weighted particle diameter	150 nm (by TEM)
Particle diameter range	+/- 20 nm



Transmission Electron Microscope (TEM) image of FUZE particles
Grains mean diameter = 162 = +/- 19 nm, 12% COV



Particles on fiber (sample: polyester)

MICROBIAL EFFICACY DATA

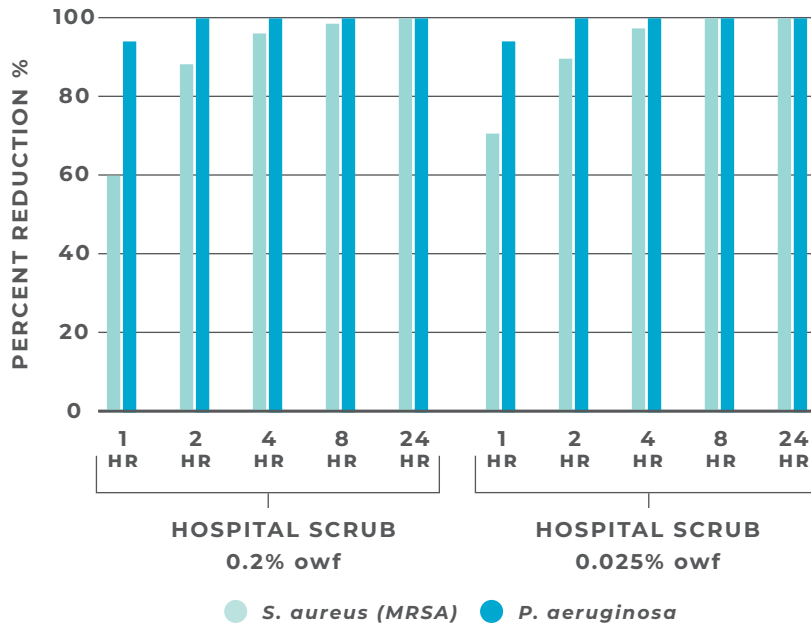
ASTM 2149 for non-leaching non-ionic antimicrobials

Assessment of Antimicrobial Finishes on Textile Materials¹ was performed on treated fabric to develop a time study profile.

Organism	% Reduction
<i>S. aureus</i>	99.9
<i>Klebsiella pneumoniae</i>	99.9
<i>E. coli</i>	99.9
<i>P. aeruginosa</i>	99.9

MICROBIAL EFFICACY DATA CONTINUED

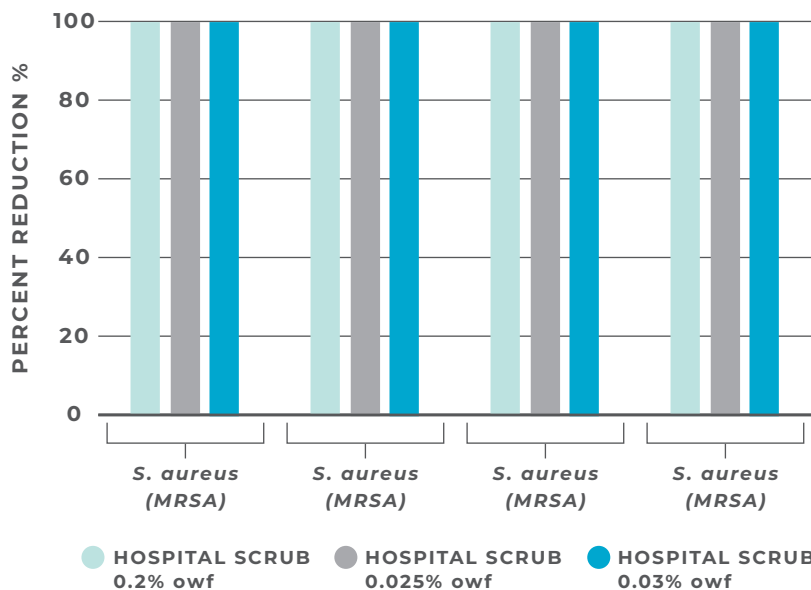
BACTERIAL TIME STUDY ON TREATED FABRIC



- Test fabric was padded with FUZE at concentrations at treat rates of 0.01% and as weight of fabric.
- Treated fabric was tested for efficacy against methicillin resistant *Staphylococcus aureus (MRSA)* and *Pseudomonas aeruginosa* at 1, 2, 4, 8 and 24 hours after exposure to 1E⁵ microorganisms.
- Methicillin resistant *Staphylococcus aureus (MRSA)* and *Pseudomonas aeruginosa* demonstrated >99% and 99% efficacy (respectively) after 4 hours.

1. Tested according to ASTM 2149 by Intertek Testing Service

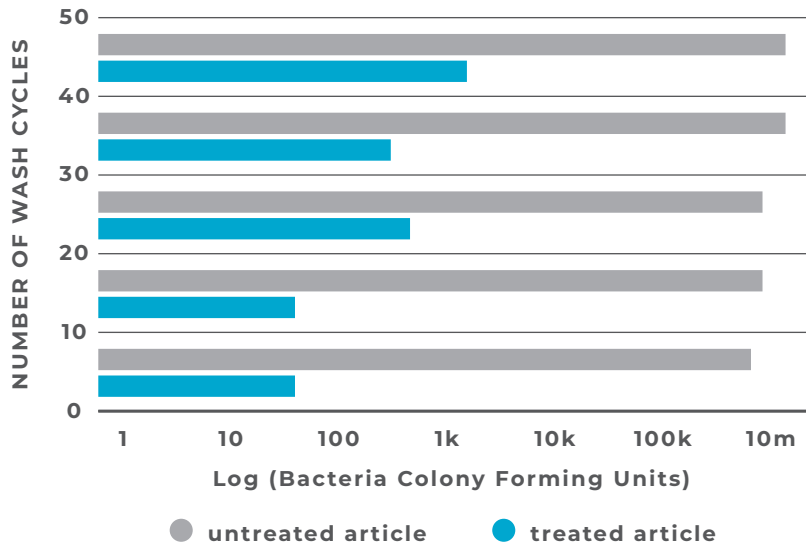
MICROBIAL REDUCTION AT 24 HOURS



- Test Fabric was padded with FUZE at various concentrations at treat rates of 0.02%, 0.025% and 0.03% weight of fabric.
- Treated fabric was tested for bacterial efficacy against 4 strains of bacteria, 2 resistant to antibiotics.
- Treated fabric was inoculated with 1E⁵ CFU/mL of each microorganism.
- After 24 hours of exposure a ≥99.98% reduction was observed for all organisms.

MICROBIAL EFFICACY DATA CONTINUED

BACTERIAL GROWTH ON TREATED AND UNTREATED POLYESTER ARTICLES



- Treated fabric at the label recommended dosage was washed at various wash cycles and tested for efficacy using modified ASTM 2149.
- ICP-MS analysis to confirm FUZE product per weight of textile.
- Microorganisms included *Staphylococcus aureus*, *Klebsiella pneumoniae*, *E. coli*.
- A 99.9% reduction was observed for all organisms after 100 wash cycles with a 0.02% treat rate by weight of fabric.

REGISTRATIONS

USA — EPA approved for use on textiles.

DISCLAIMERS

Use of Product & Testing

Variability in efficacy of treated textiles may occur depending on type of fiber, treatment rate, method of application and other factors. As a result, it is the user's responsibility to validate performance claims on their finished products. Because many factors may affect processing or application use, we recommend that you perform comprehensive tests to determine the suitability of this product for your particular purpose and manufacturing processes prior to use. Do not use this product to treat material intended for food-contact uses.

Regulatory

It is the users responsibility to ensure that its activities and use of complies with all federal, state, provincial or local laws where your finished product will be manufactured, sold and / or used.

International

The regulatory landscape is fast-changing and applicable laws and usage conditions may differ from one country to another and may vary with time. Check with the regulatory bodies of the countries where your product will be manufactured, sold and / or used for more information.

United States

FUZE is not intended to prevent disease, it is used for protection of the treated textiles. Neither this product nor the articles treated with this product may state or imply any public health claims. Active healthcare claims including antiviral claims on treated articles are not permitted by the U.S. Food & Drug Agency (FDA) and U.S. Environmental Protection Agency (EPA) and require prior regulatory approval.

Representations & Warranties

This document and any information provided herein by FUZE Technologies does not constitute a legally binding obligation of FUZE Technologies. While the descriptions, designs, data and information contained herein are presented in good faith and believed to be accurate, it is provided for your guidance only. FUZE Technologies makes no representation as to its comprehensiveness or accuracy. It does not relieve our customers of any obligation to perform a full inspection of the products upon delivery or any other obligation.

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