

Acteev[®]

Permanent,
Natural No-odor
Protection in
Athleisure and
Athletic Wear



Acteev[®]

Permanent,
Natural No-odor
Protection in
Athleisure and
Outdoor Wear

 ASCEND[®]
PERFORMANCE MATERIALS



Agenda

- Introductions
- What is Acteev?
- The Acteev difference
- Sustainability
- Acteev in action



The Acteev Difference

Acteev®



What is Acteev?

Acteev

Acteev combines durable nylon 6,6 with safe, natural zinc for permanent antimicrobial, anti-odor protection.

Innovative

Winner of ISPO Textrends Top 10 Award and Outdoor Retailer Innovation Award, and protected by more than 100 patents globally.

Permanent

Protected with zinc ion technology embedded into the matrix of polyamide 66 to provide permanency, preventing it from washing out like some topical treatments.

Design friendly

Yarn made with Acteev behaves like standard nylon 6,6, which means it can be dyed any color – including black, deep shades and pastels, with no unwanted heather streaks or yellowing. Additionally, it can easily be constructed into any type of knit or woven fabrics, including blends.

Natural zinc to stop odor

Active zinc ions eliminate odor-causing bacteria. Plus, zinc is a natural mineral required by the human body, and the active ingredient in Acteev is listed by the FDA as GRAS – Generally Regarded As Safe – and registered with the EPA.

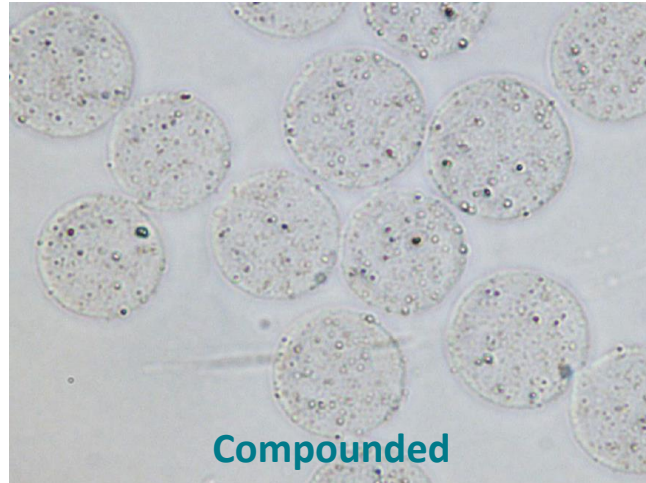
Sustainable

Acteev is available made of up to 30% plant-based feedstock or as a carbon-neutral offering. Plus, Acteev yarns are made of one of the strongest polymers in the industry – nylon 6,6 – and are built to last, not disposable and quick to hit the landfill.



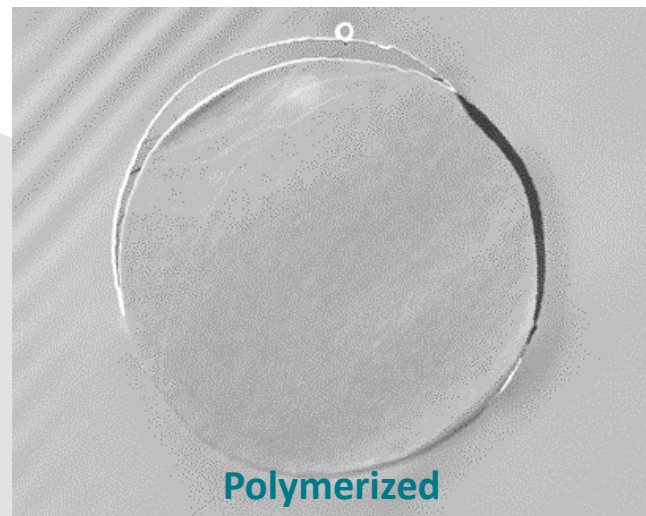
A novel solution: embedded active ingredients

Acteev[®]



Nylon 6,6 with embedded zinc offers long-lasting protection with no compromise in processing or performance.

- Acteev's active ingredients are added during the polymerization process, leaving them evenly dispersed at the molecular level.
- Because they are well-distributed, the embedded zinc ions are always available to combat the growth of odor-causing bacteria and microbes.
- The result is a high-performance, durable, anti-odor nylon 6,6 that can be dyed like standard polyamides.



Sustainability

Acteev[®]



Meeting your sustainability goals

Acteev[®]

Responsible stewardship of every molecule



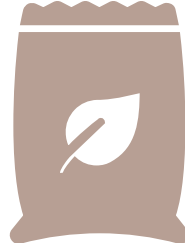
Reduced emissions

Our investment of more than \$200 million toward the reduction of greenhouse gas emissions helps benefits you and your customers – and the planet.



Carbon neutral

Our fibers and nonwovens are available as 100% carbon-free. And our investments allow us to pass along carbon neutrality to your final product.



Plant-based polymer

Bio-based products are ISCC+ certified with up to 30% renewable feedstock, and options with up to 70% renewable feedstock are coming soon.



Powered by nature

Our active ingredient is based on zinc, a natural mineral required by the human body used in everything from baby products to breakfast cereal.



Built to last

Acteev yarns are made of nylon 6,6 – one of the most durable fibers available. Apparel made with Acteev remains odor-free for the life of the garment.



A second life for textiles

Our partner company, Circular Polymers by Ascend, recycles nylon, polypropylene and polyester into high-performance polymers.

Renewable plant-based feedstocks

Acteev®

- Acteev will be available made with up to 30% renewable biobased feedstock.
- Using plants rather than nonrenewables supports our goal of creating lasting, meaningful sustainability solutions.
- Coming soon: options made with up to 70% renewable feedstock



Third-party certified

Receive a certificate from the International Sustainability & Carbon Certification program ISCC PLUS to ensure traceability and chain of custody.

Globally recognized

Gain expanded access to international markets that are increasingly recognizing ISCC PLUS as the standard of choice for industry sustainability certifications.

Same great quality

Count on the same process reliability and product performance as fossil fuel-based nylon but with a lower carbon footprint.

Our sustainability purpose

Acteev[®]

Empowering People

- Upholding ethical and fair business practices
- Providing safe and healthy work environments
- Offering careers that develop with training and opportunity
- Creating a culture that values differing views and backgrounds
- Supporting our communities

Innovating Solutions

- Developing materials that help our customers achieve their sustainability goals
- Creating products with lower environmental impacts
- Helping solve critical challenges in renewable and low-emissions technologies
- Sourcing ethical and sustainable raw material and logistics resources

Operating Without Compromise

- Reducing waste, emissions and water use throughout our operations
- Maximizing the quality of our products
- Using resources efficiently
- Disposing of waste responsibly
- Shifting to cleaner energy sources, including cogeneration and solar power

Acteev in
Action

Acteev[®]



Independent testing results

Independent laboratories have tested this technology for efficacy against common bacterial and fungal strains.*

Microbe	Test Method
Staphylococcus aureus	ISO 20743
Klebsiella pneumoniae	ISO 20743
Escherichia coli	ASTM E3160
Aspergillus brasiliensis Penicillium funiculosum Chaetomium globosum Trichoderma virens Aureobasidium pullulans	ASTM G21

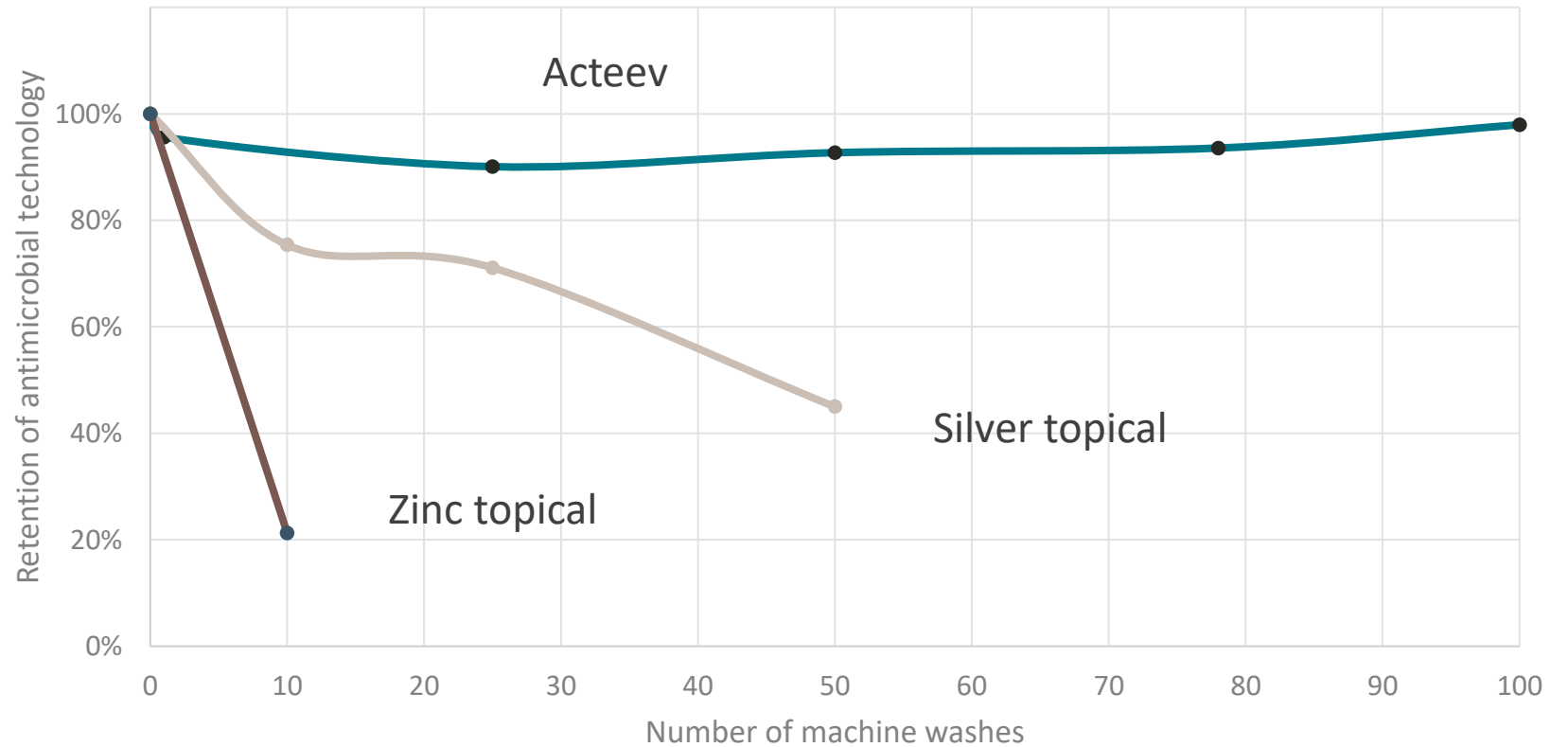
**Acteev's antimicrobial technology is embedded to protect the product. The product does not protect users or others against disease-causing bacteria, viruses, germs or other organisms. Bioefficacy data (including antibacterial and antifungal) cannot be used on marketing materials, packaging or digital content in association with Acteev even when referencing Acteev. Regulations in other countries may differ. This presentation is for discussion purposes only. Consumer-facing literature and claims need to follow the appropriate regulatory and legal validation and review process. Testing conducted on various end forms. Please refer to technical data sheet for data on specific products.*

Permanent protection – even after laundering

Acteev[®]

Even after 100 washes, Acteev retains its efficacy.

Topical treatments begin to fade as soon as the first few launderings.



Test method: AATCC LP01

More durable than polyester

Acteev®

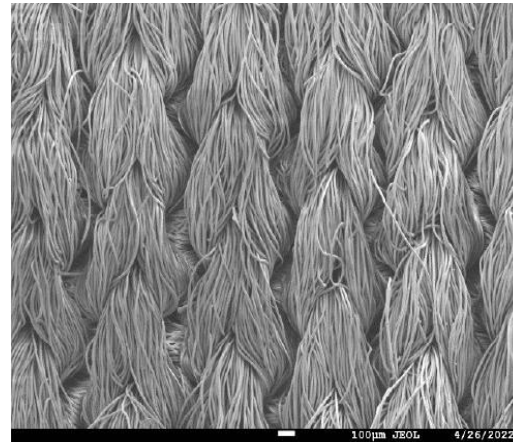
Polyester shows more breakage and mass loss after 100,000 abrasion test cycles.

Test method:
ASTM D4966, Option 3

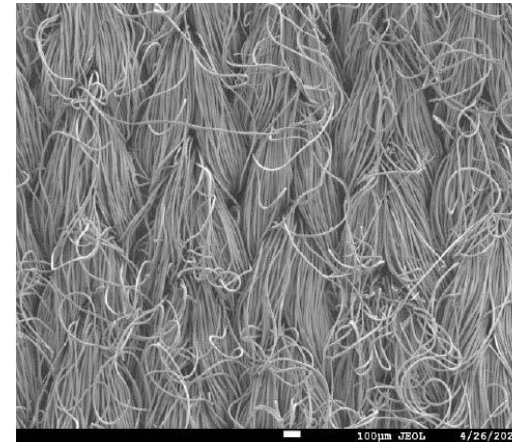
Each fabric contains 8% spandex

Acteev®

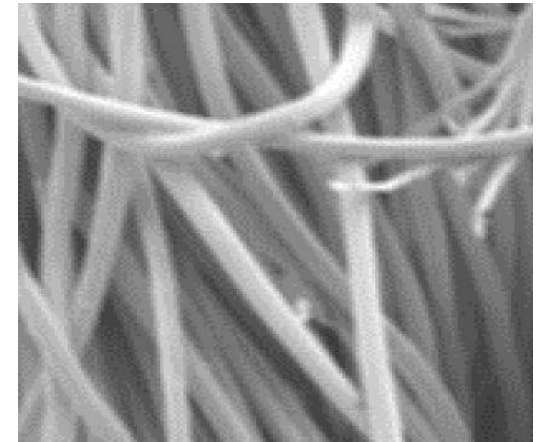
SEM images of unabraded fabric



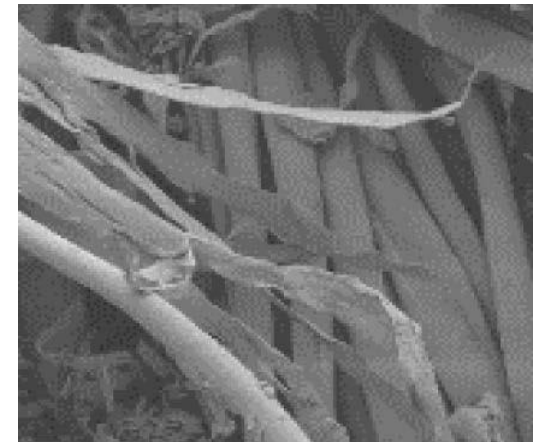
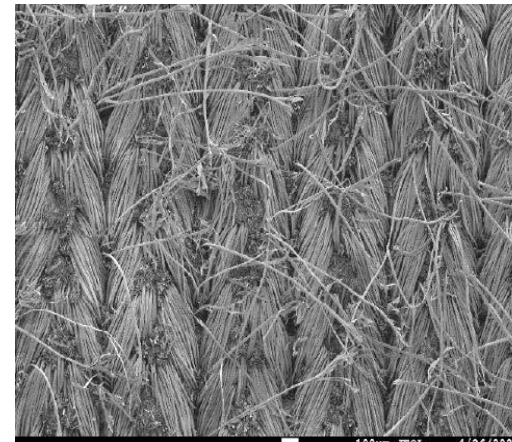
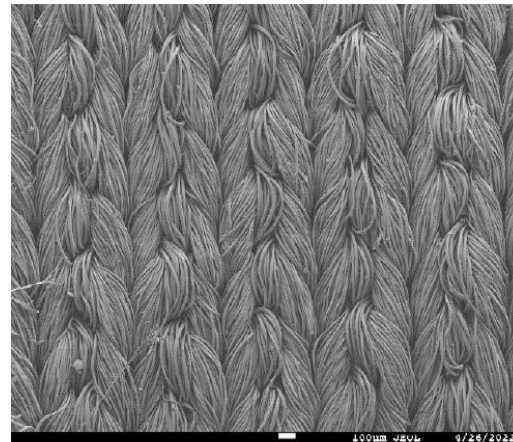
SEM images after 100,000 cycles



SEM images after 100,000 cycles, higher magnification



Polyester



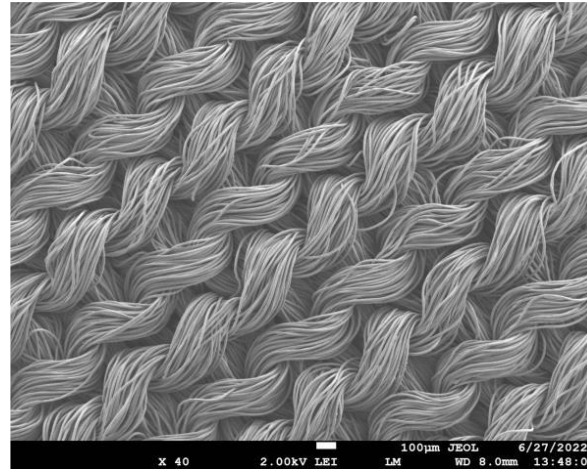
Performs in real-world conditions

Acteev®

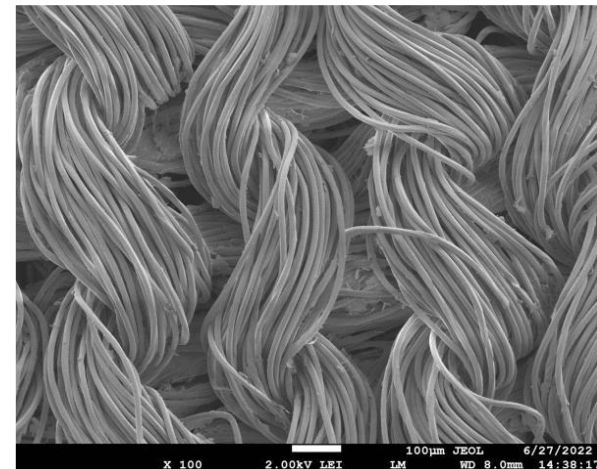
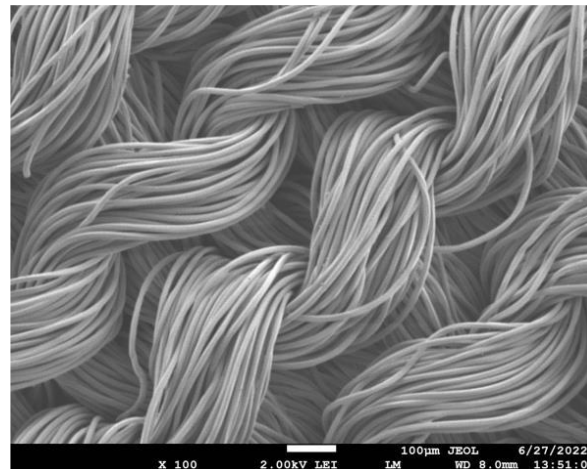
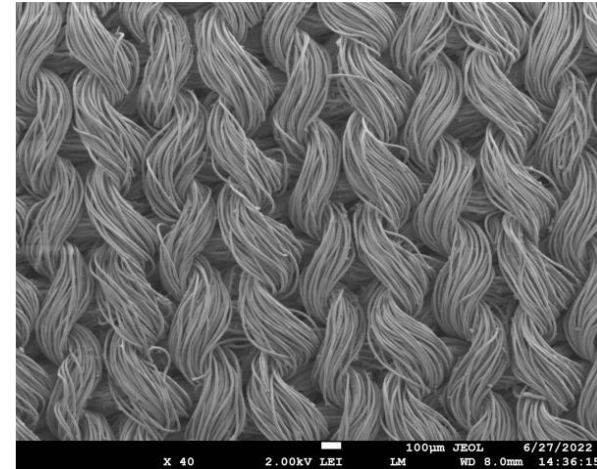
One tester wore a shirt made with Acteev once per week while working out, and then washed and dried the shirt in his home appliance.

After nine months of wear, only one broken fiber was observed.

New shirt



After 9 months of wear



Less odor than polyester

Acteev

The same tester alternated the Acteev shirt with a similar athletic-style shirt made of polyester.

After 9 months, the polyester shirt had a noticeable unpleasant odor, while the Acteev shirt remained odor-free.



Fabric mill support

Our experts provide complete toolkits for dyeing Acteev as well as technical support throughout the process

Dyeing and Finishing Technical Guideline for Textile Applications Acteev

Dyeing and Finishing Technical Guideline for Textile Applications Acteev

Dyeing and Finishing Technical Guideline for Textile Applications Acteev

Dyeing and Finishing Technical Guideline for Textile Applications Acteev

Introduction

Fibers, yarns, and fabrics made with Acteev® have active zinc ion technology embedded in the polymer matrix which imparts antimicrobial functionality to the finished products. Special care and attention are needed during the dyeing and finishing processes to maintain adequate functionality of the zinc ion technology. This technical guide provides the recommended processing steps to achieve deep colors and uniformity in dyed fabrics/yarns with excellent colorfastness and minimal loss of zinc ion technology, although some loss is to be expected and built in.

Increased attention to pH during all wet processing steps is required as the zinc ion technology is sensitive to low pH conditions. A verification of each processing step is recommended when first starting to work with Acteev® to make sure each processing step does not remove an excess of the zinc ion technology. To verify each step, a small fabric swatch approximately 2" x 2" or ~2-3 grams is needed for analysis of the Acteev® zinc ion technology content. Ascend analytical labs can quickly verify each step, ensuring the minimum technology content is present for maintaining antimicrobial functionality in the final products).

Knitting and Weaving

Acteev® continuous filament yarns can be knitted, woven, textured, and blended/dyed with spandex like any other fibers.

Reach out to your Ascend technical representative for fabric constructions and/or blending with non-spandex fibers.

Scouring

Maintaining neutral or basic pH, use non-ionic soap and sodium carbonate with heating as needed up to 80 °C. Do not add any acids or scour at low pH.

Dyeing and Finishing

Dyeing is the most critical step for Acteev® yarns and fabrics as precise control of pH is required. The recommended pH control system is an acid donor buffered with soda ash. Specifically - Opticool® VS liq c is recommended due to its high potency and gradual pH decrease which allows for uniform dyeing. The target ending pH is between 5.5 - 6.0 to maintain optimal retention of Acteev® zinc ion technology and can be achieved by adjusting the acid donor concentration. As a starting point, 0.4 g/L is recommended but may require adjustment due to specific water quality, dye stuff, colorshade, and/or acid donor batch. In general, retention of Acteev® zinc ion technology will improve with higher ending pH but may come at the expense of dye exhaustion above the upper 6.0 pH range target. The recommended dyeing process for acid and metal complex dyes is shown below using the acid donor buffer with soda ash.

A short rinsing step at neutral pH is recommended to improve colorfastness. A specific fixative - Hydrocol APR is recommended due to its ability to be used effectively at neutral pH.

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General guidelines

Dye Recipe: Light Blue Acteev

Dye Recipe: Beige Acteev

Dye Recipe: Black Acteev

Fabric Composition: 91% Acteev, 9% Spandex
Fabric Construction: Single Jersey

Legend:

- A: 0.1 g/L Sodium Carbonate
- B: 0.4 g/L Opticool® VS liq c [Archroma]
- C: 3.5% owf Lanasin® Black-S-DL [Archroma]
- D: 2.0% owf Levegal® SE-R 01 [Tanatex Chemicals]
- E: 2% owf Hydrocol APR [Rudolf]

The data contained in this report is confidential information intended for the recipient only. There are not approved product claims. Patent, regulatory and legal reviews are required before publishing any external facing literature or packaging material, including digital media.

Validated shade formulations

Fabric Test Report Acteev

Fabric Test Report Acteev

Fabric Test Report Acteev

Expected Acteev Retention and Antimicrobial Performance

Acteev Retention	Test Method	Test Organism	Contact Time (hours)	Control	Percent Reduction vs. Control
56%	ISO 20743	Staphylococcus aureus	24	Cotton	>99.99%
	ISO 20743	Klebsiella pneumoniae	24	Cotton	>99.99%

Testing Performed at an International Accredited Council (IAC) certified third-party laboratory

Colorfastness to Crocking - AATCC TM8

Dry Crocking	Wet Crocking
4.5	4.5

Testing Performed by qualified third-party laboratory

Colorfastness to Laundering - AATCC TM15-2A

Staining Agent	Staining Cotton	Staining Nylon	Staining Polyester	Staining Acrylic	Staining Wool	Sample Shade Change
4.0	4.0	3.0	4.5	4.5	5.0	4.5

Testing Performed by qualified third-party laboratory

Colorfastness to Perspiration - AATCC TM15

Solution Type	Staining Acetate	Staining Cotton	Staining Nylon	Staining Polyester	Staining Acrylic	Staining Wool	Sample Shade Change
Alkaline	5.0	5.0	4.5	5.0	5.0	5.0	5.0
Acid	5.0	5.0	5.0	5.0	5.0	5.0	5.0

Testing Performed by qualified third-party laboratory

Colorfastness: Dye Transfer Option II - AATCC TM163

Staining Agent	Staining Cotton	Staining Nylon	Staining Polyester	Staining Acrylic	Staining Wool	Crockmeter Test Cloth	Test Specimen Color Change
5.0	4.5	4.5	5.0	5.0	5.0	5.0	5.0

Testing Performed by qualified third-party laboratory

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Formulations performance

Award-winning innovation

Acteev®

ISPO Textrends Top Ten

Outdoor Retailer
Innovation Award

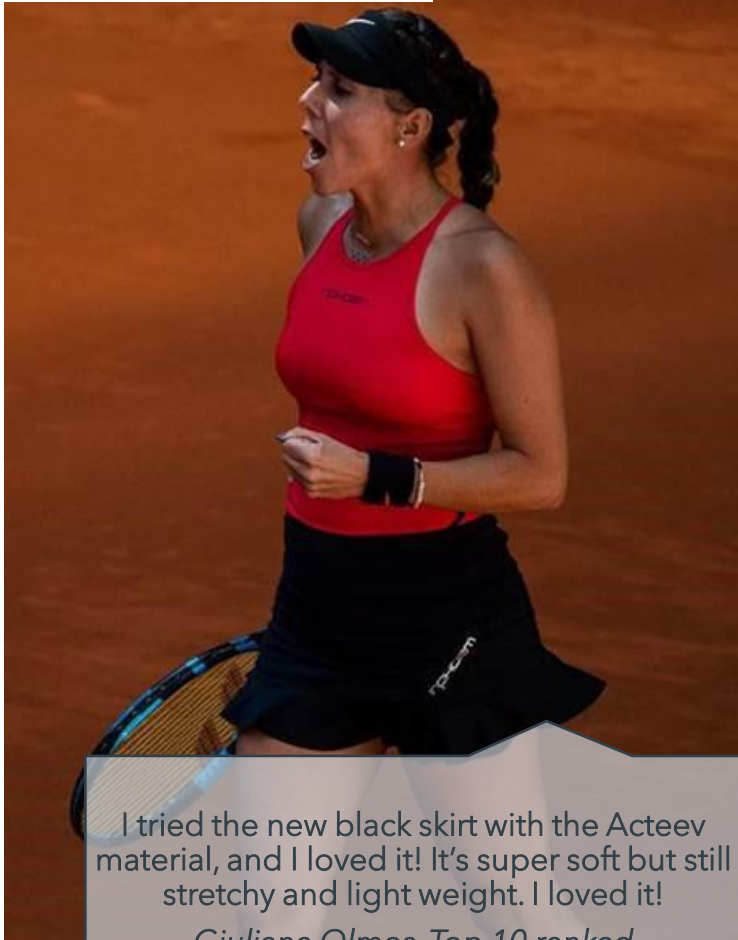
SPE Innovations Award
Finalist



Customers love Acteev

Acteev

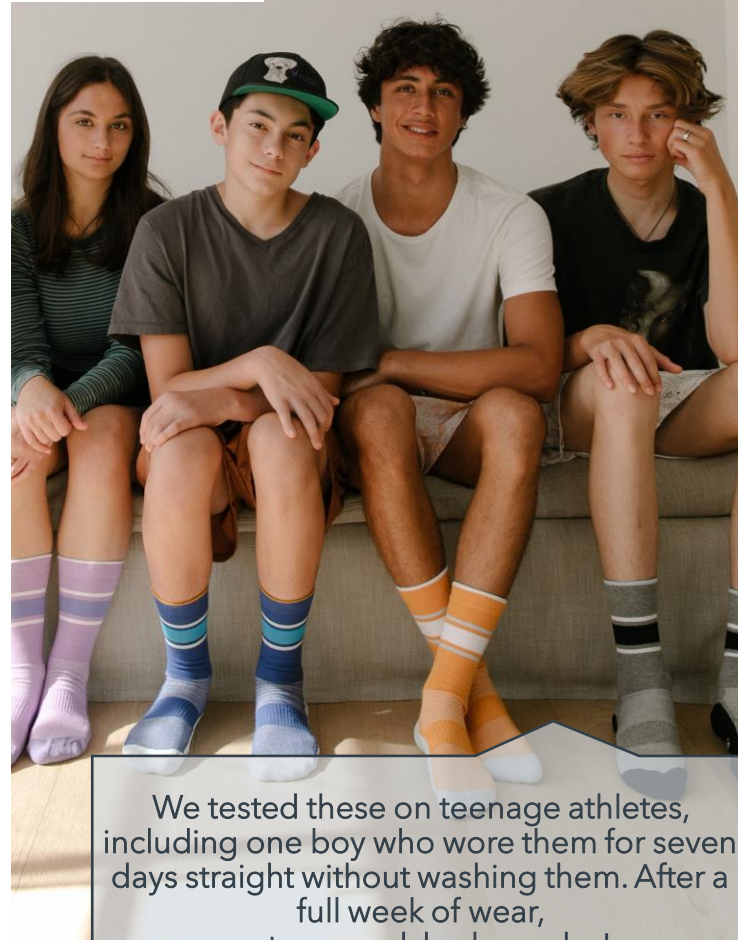
INFORM



I tried the new black skirt with the Acteev material, and I loved it! It's super soft but still stretchy and light weight. I loved it!

Giuliana Olmos, Top 10 ranked professional Women's Tennis Association tennis player

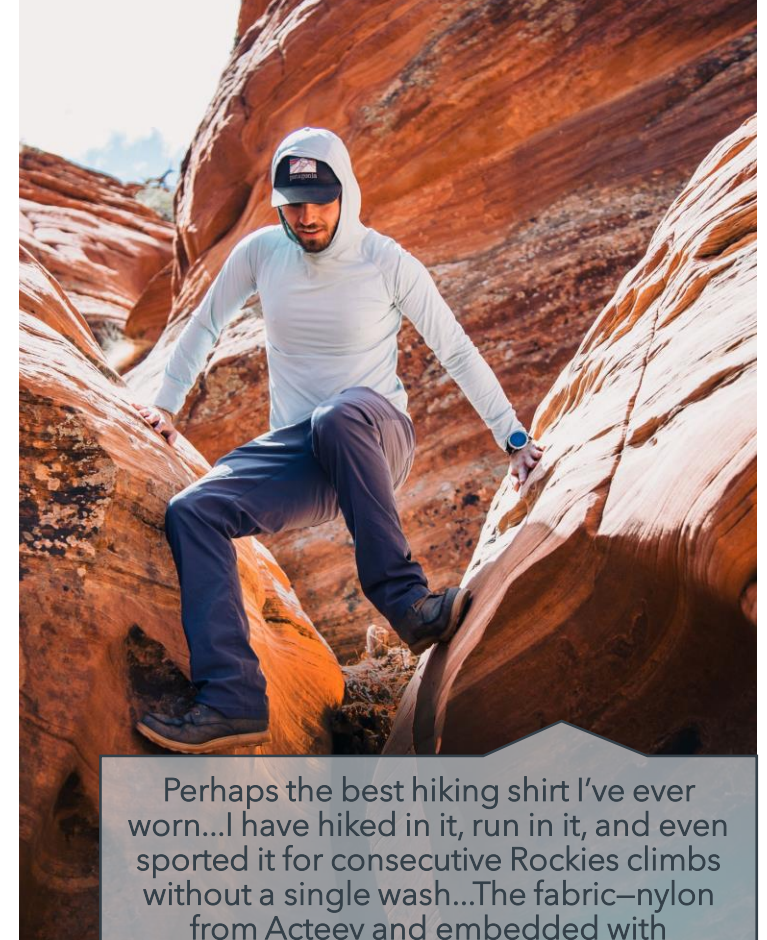
OOMLA



We tested these on teenage athletes, including one boy who wore them for seven days straight without washing them. After a full week of wear, not one sock had an odor!

Cara Netterson, M.D., Founder of OOMLA

COALATREE
ECO-MINDED GOODS



Perhaps the best hiking shirt I've ever worn...I have hiked in it, run in it, and even sported it for consecutive Rockies climbs without a single wash...The fabric—nylon from Acteev and embedded with antimicrobial zinc—is still as buttery soft and smell-free as the day it arrived.

Outside Magazine

Backed by science

Acteev



Acteev Medical Advisory Board



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Research Article

Zinc-Embedded Polyamide Fabrics Inactivate SARS-CoV-2 and Influenza A Virus

Vikram Gopal,^{*} Benjamin E. Nilsson-Payant, Hollie French, Jurre Y. Siegers, Wai-shing Yung, Matthew Hardwick, and Aartjan J. W. te Velthuis^{*}

Cite This: <https://doi.org/10.1021/acsami.1c04412>

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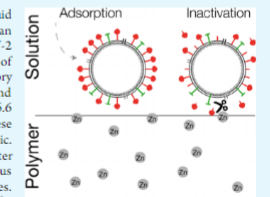
ACCESS |

Metrics & More

Article Recommendations

ABSTRACT: Influenza A viruses (IAV) and SARS-CoV-2 can spread via liquid droplets and aerosols. Face masks and other personal protective equipment (PPE) can act as barriers that prevent the spread of these viruses. However, IAV and SARS-CoV-2 are stable for hours on various materials, which makes frequent and correct disposal of these PPE important. Metal ions embedded into PPE may inactivate respiratory viruses, but confounding factors such as adsorption of viruses make measuring and optimizing the inactivation characteristics difficult. Here, we used polyamide 6.6 (PA66) fibers containing embedded zinc ions and systematically investigated if these fibers can adsorb and inactivate SARS-CoV-2 and IAV H1N1 when woven into a fabric. We found that our PA66-based fabric decreased the IAV H1N1 and SARS-CoV-2 titer by approximately 100-fold. Moreover, we found that the zinc content and the virus inactivating property of the fabric remained stable over 50 standardized washes. Overall, these results provide insights into the development of reusable PPE that offer protection against RNA virus spread.

KEYWORDS: influenza, coronavirus, adsorption, zinc, face mask



INTRODUCTION

Infections with influenza A viruses (IAV), influenza B viruses, and coronaviruses (CoV) are a burden on our healthcare

receptor ACE2, while IAV uses its HA protein to bind sialic acid receptors.⁶

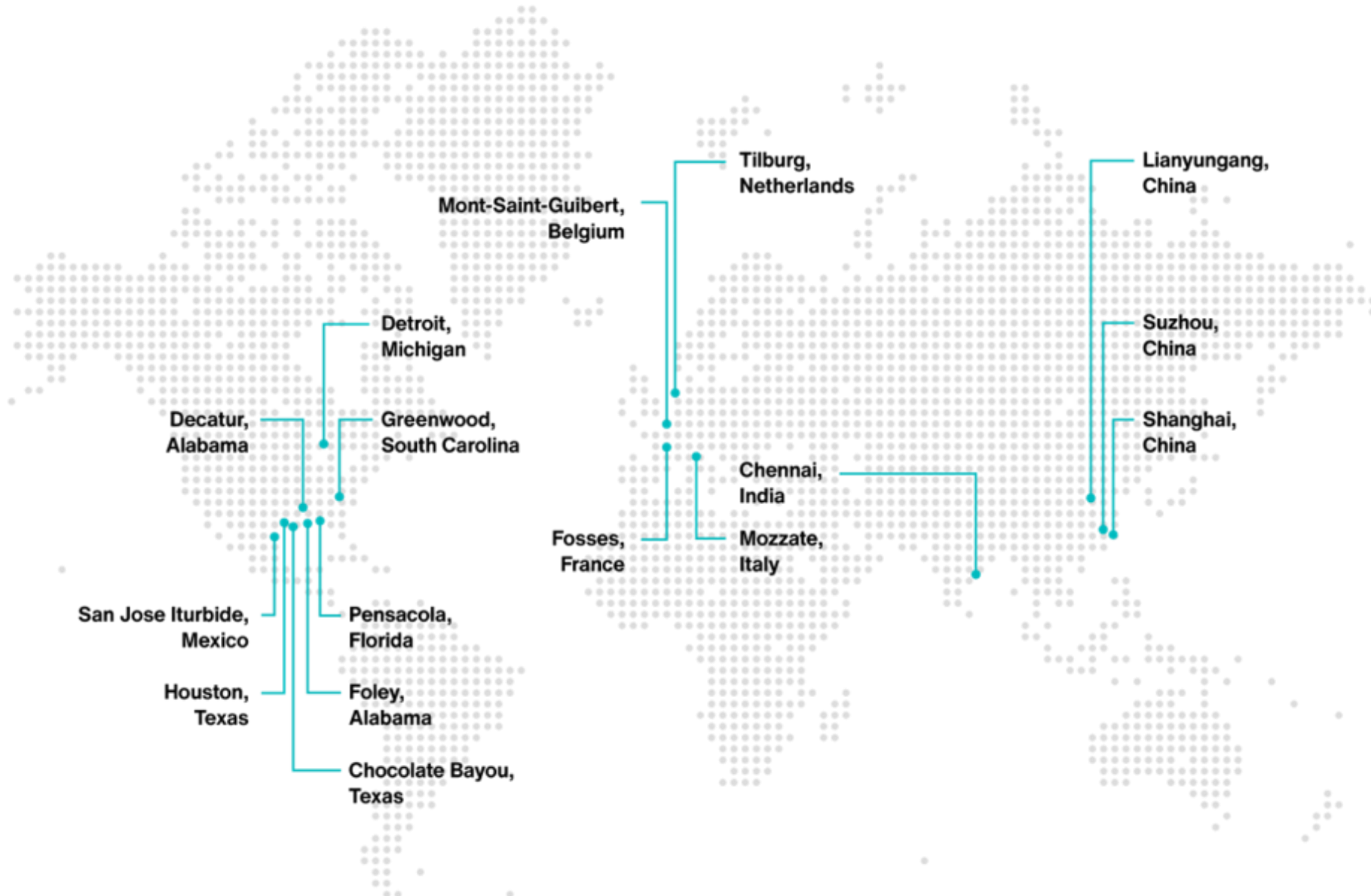
While antivirals and vaccines are available for the treatment and containment of IAV and SARS-CoV-2 infections,^{7–10} the

- World's largest fully integrated polyamide 6,6 resin manufacturer with \$3.2 billion in annual revenue
- 70-year history in revolutionizing safety in everyday products
- Decades of experience in high-performance life-critical fiber applications such as air bags and tire cords
- Top 100 USA exporter
- Inventor of Acteev zinc-based technology covered by more than 100 patents worldwide



Global reach, worldwide excellence

Acteev



Polymer production:
U.S.A.

Yarn production:
U.S.A. and Asia

Fabric mill partners:
Americas and Asia

Headquarters:
Houston, Texas



*This product does not protect users or others against disease-causing bacteria. This presentation is for discussion purposes only. Consumer-facing literature and claims need to follow the appropriate regulatory and legal validation and review process.

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