

IONIC+ MINERAL ANTIMICROBIAL

NATURALLY SELF-CLEANING ANTIMICROBIAL FABRIC



Mineral Antimicrobial

THE SCIENCE OF SILVER

The active ingredient in IONIC+ Mineral Antimicrobial - silver, has been used to inhibit bacterial, and microbial growth, prevent infection, and promote human health since 1300 BC.

When applied properly, positively charged silver ions are attracted to negatively charged bacteria. The ions attracted to the bacteria's DNA disrupt its respiration, cell division, and replication processes.

Over time, as the application of the science has evolved, silver has been integrated into numerous products across a broad range of industries: cosmetics, textiles, medical devices, advanced woundcare, and more.

At NOBLE, silver is in our DNA. Since our team pioneered silver in textiles with commercial metalized filament, we have continued to push the barriers of mineral antimicrobial technology.

THE MOST ADVANCED ANTIMICROBIAL SYSTEM ON THE MARKET

We are NOBLE - the global leader in fiber science. Our smart technologies are developed to power products that solve real problems; protecting, saving, healing, and improving lives.

We consider this **The Noble Advantage**.

ANTIMICROBIAL ADVANTAGE

IONIC+ is the broadest spectrum of antimicrobial technology that protects against the growth of microbes on fabric for clothing, footwear, bedding, luggage, furniture, medical wound care products, and other soft surface applications.

TREATMENTS

Three highly effective treatments are currently available:

- 1) **IONIC+ PERMANENT ANTIMICROBIAL: METALIZED**
pure silver metalized filament
- 2) **IONIC+ PERMANENT ANTIMICROBIAL: EXTRUDED**
high purity silver permanently bound within the polymer fibers
- 3) **IONIC+ DURABLE ANTIMICROBIAL: TOPICAL**
advanced silver surface treatment bonds directly to fabric

BENEFITS

- High purity silver antimicrobial technology
- Self-cleaning, continuous, sustained release of silver ions without shedding of elemental silver
- Fights microbes that accumulate on fabric
- Eliminates odor-causing bacteria on fabric
- Fewer washes to conserve energy, water, and natural resources
- Reduces fabric degradation over time
- Tested and proven (EPA registered, BPR compliant, and OEKO-TEX Standard 100 certified)
- Responsibly sourced: made with ions found in water, land, and sea
- Absolutely no nanotechnology



PERFORMANCE PORTFOLIO



IONIC+® PERMANENT ANTIMICROBIAL: METALIZED

- Metalized filament with high purity silver permanently bonded to the surface of nylon fiber
- Extremely durable, flexible, and available in a wide range of deniers
- Product can be made with natural and man-made fibers (nylon, cotton, wool, polyester, acrylic, etc.)
- Spun filament can be engineered to provide optimum benefits based on the application
- Performance is permanent and lasts the life of the fabric
- Permanently silver appearance offers opportunities to showcase the technology in the design of the fabric



IONIC+ PERMANENT ANTIMICROBIAL: EXTRUDED

- Silver ions are embedded into the fiber through extrusion
- Flexible, very durable, and offered in a wide range of deniers
- Uses high purity silver with either virgin or recycled polyester or nylon
- Product can be blended with natural and man-made fibers (nylon, cotton, wool, polyester, acrylic, etc.)
- As the silver ions are actually part of the fiber, the ions do not wash out and last for the life of the fabric.
- Completely dyeable, coloring options allow for endless design possibilities



IONIC+ DURABLE ANTIMICROBIAL: TOPICAL

- This advanced, silver-based, topical fabric finish is an effective, expedient way to deliver antimicrobial benefits
- Applying the treatment at the finishing stage allows for flexibility in terms of production and application (fabric style, color, weight, volume, etc.).
- Meets or exceeds state-of-market performance and has achieved a 50x wash durability rating

MARKET SEGMENT: APPAREL/FOOTWEAR/HOME/LIFESTYLE

DELIVER A LIFESTYLE WITH CONFIDENCE BUILT IN.

Humans can distinguish at least 1 trillion odors. When bacteria and their resulting odors are eliminated from fabric by a self-cleaning mechanism, life is more convenient. Clothing stays fresher longer, and extended cleaning intervals mean less work and more time for the important things in life.



Humans produce two kinds of sweat. Eccrine is the watery, salty, neutral-smelling sweat found on the skin all the time. Apocrine sweat is a thick, oily fluid made up of fatty compounds. Both are produced from the glands and neither stinks on its own. Microbes on the skin eat the apocrine compounds and produce the molecular waste that creates odors and stains. IONIC+® antimicrobial treatments make clothing, bedding, footwear, and accessories inhospitable to microbes, mitigating the impact of odors, stains, and degradation.

MARKET SEGMENT: MEDICAL/HEALTHCARE/WOUNDCARE

PROFESSIONALS CARE FOR THE PATIENTS. LET THE SCIENCE TREAT THE FABRIC.

Healthcare Associated Infections (HAIs) are widely acknowledged as one of the world's leading healthcare challenges. A highly versatile and powerful technology, IONIC+ has demonstrated rapid bactericidal activity against a broad range of pathogens in a pharmacotherapy in vitro model. Proven clinical studies, performed in hospitals on soft surfaces, show that IONIC+ successfully reduces pathogens on fabric in just 1 hour. When used in bedding and patient/staff apparel, IONIC+ eliminates odor, resists stains, and is comfortable against the skin. Its self-cleaning nature requires no behavior modification to ensure efficacy.



Numerous studies show that fabrics in healthcare settings quickly become contaminated with pathogens while in use. Adding IONIC+ antimicrobial properties to fabrics limits the bioburden on the surface and reduces the risk for cross-contamination. IONIC+ is currently on the market in millions of healthcare products.

MARKET SEGMENT: HOSPITALITY/TRANSPORTATION/FURNITURE

WORRY-FREE WANDERING. SAFETY IN SOFT SURFACES.

People will always travel, commute, and move about the world. Now, more than ever, they understand that soft surfaces can transmit bacteria and viruses. Built into the fabric, IONIC+ acts methodically to clean microbes from these surfaces while the world turns at a rapid pace. From a train seat to a baby seat, IONIC+ plays an integral role in enabling healthy travel practices.



Microbes are everywhere. In our global society, where borders are not boundaries, transmission of these microbes expands exponentially. Using antimicrobial materials in the creation of products like luggage, hospitality areas, and mass transit seating, is a proactive step forward in limiting dispersion and protecting against transmission.

DATA THAT SPEAKS WHEN WE CANNOT



Mineral Antimicrobial

NOBLE's products fall into certain regulated categories in which we are prevented from making specific "end user" claims.

Out of respect for the regulatory institutions, the content on pages 4-7 of this document - although accurate - cannot be used in product sales and marketing in the USA.

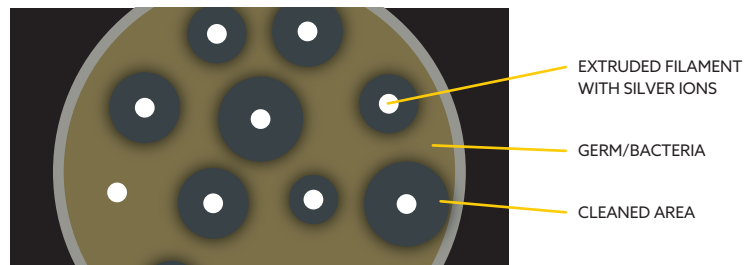
Please refer to the IONIC+ branding guidelines for approved claims and visit our website for more information: NobleBiomaterials.com

ANTIMICROBIAL FABRIC IN ACTION

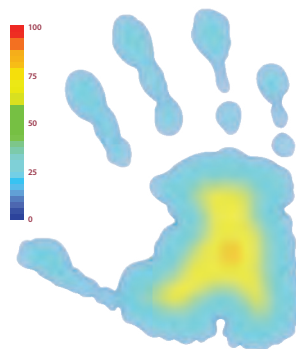
This touch simulation of real test results represents a time-lapse of microbial kill rates on fabric (micro-organisms include bacteria, fungi, and viruses). Although IONIC+ is registered with the EPA as an antimicrobial, the EPA and FIFRA only allow discussions related to efficacy against bacteria and fungi. At this time, in the USA market, making viral claims to consumers is prohibited.

ZONE OF INHIBITION

Like antibiotics, silver ions inhibit microbial growth and reproduction. In the petri dish, you can see how microbes refuse to grow near silver ions. By dosing the fabric correctly (7-10% of the filament), we create this zone of inhibition all over the garment.



99.9% MICROBIAL KILL RATE ON FABRIC IN JUST 59 MINUTES



- 10 minutes = 46.9% killed
- 20 minutes = 70.6% killed
- 30 minutes = 84% killed
- 40 minutes = 91.3% killed
- 59 minutes = 99.9% killed

Antimicrobial Textile Simulation / Toray

IONIC+® PROOF OF EFFICACY

EFFECTIVE AGAINST
 SARS-CoV-2 and HCoV-229E • H1N1 and H3N2
 FELINE CALICIVIRUS • DRUG-RESISTANT BACTERIA

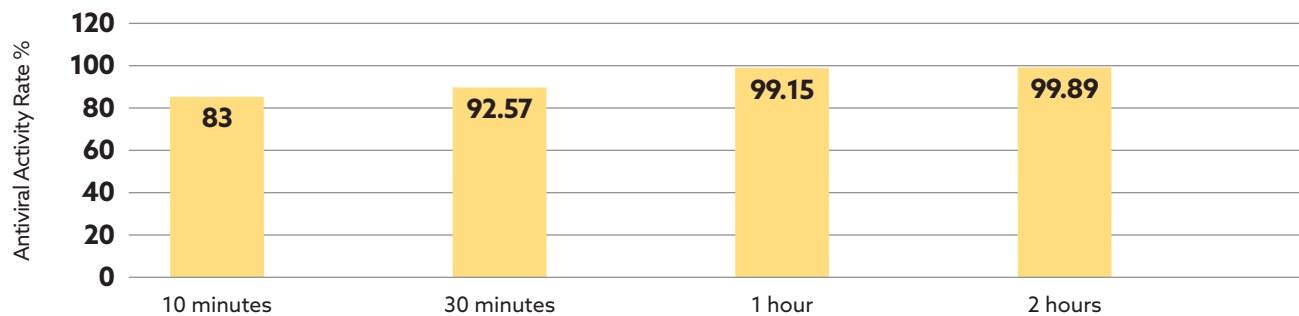
SARS-CoV-2

STARTS WORKING IMMEDIATELY ON SURFACE CONTACT

IONIC+ Permanent Antimicrobial: Extruded Filament

151 gsm Woven Fabric / 34% Polyester, 30% IONIC+, 26% Cotton, 10% Elastane

Reduction in Virus Viability



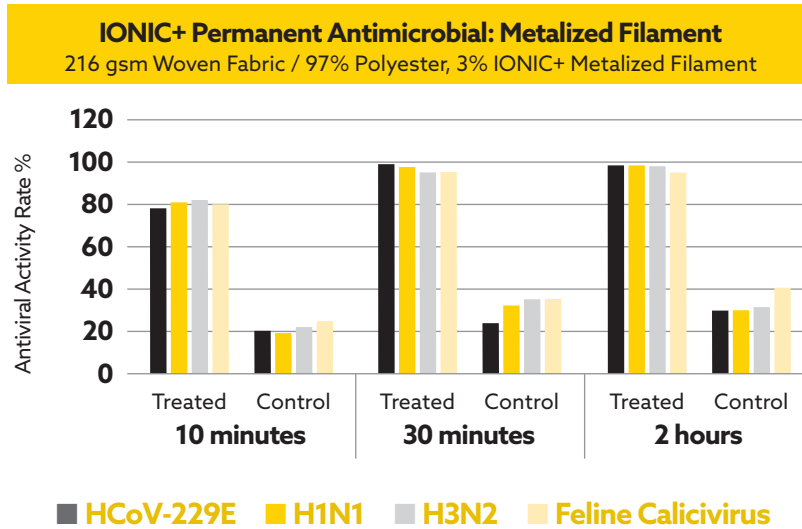
Test Method: ISO 18184, Test No: 190820-2

Treated

Disclaimer: In the USA, IONIC+ is EPA registered as an antimicrobial material preservative. As such, according to EPA registration requirements, claims and end product marketing copy are limited to material preservation claims - protection of the fabric from bacterial and fungal fabric impacts associated with odor and staining. At this time, in the USA market, making viral claims to consumers is prohibited.

IONIC+® PROOF OF EFFICACY

IONIC+ Permanent Antimicrobial: Metalized Filament			
Reduction in Virus Viability			
	10 minutes	30 minutes	2 hours
HCoV-229E	78.07	98.28	98.87
H1N1	81.35	95.75	98.63
H3N2	82.42	94.79	98.43
Feline Calicivirus	80.44	95.35	95.86



TEST RESULTS

4X BETTER THAN CONTROL
AT REDUCING VIRUS VIABILITY

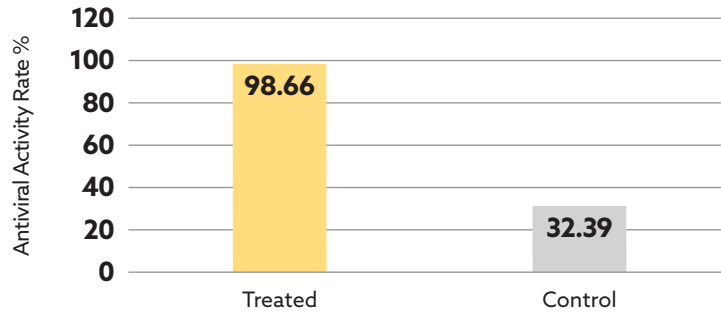
Test Method: ISO 18184

Test No: WP-20056185-JC-01En

Disclaimer: In the USA, IONIC+ is EPA registered as an antimicrobial material preservative. As such, according to EPA registration requirements, claims and end product marketing copy are limited to material preservation claims - protection of the fabric from bacterial and fungal fabric impacts associated with odor and staining. At this time, in the USA market, making viral claims to consumers is prohibited.

HCoV-229E: 2 HOURS**IONIC+® Permanent Antimicrobial: Metalized Filament**

140 gsm Knitted Fabric / 59% Nylon,
34% Polyester, 4% Elastane, 3% IONIC+

**TEST RESULTS**

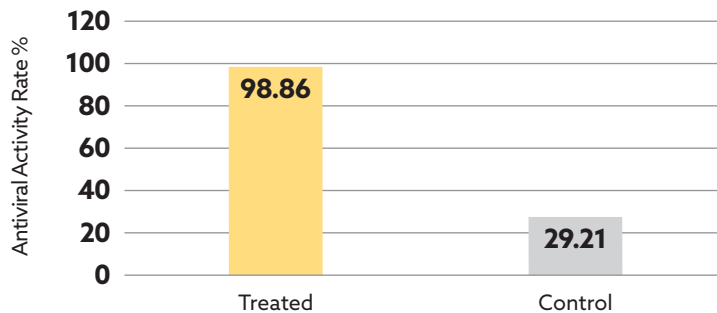
3X BETTER THAN CONTROL
AT REDUCING VIRUS VIABILITY

Test Method: ISO 18184

Test No: WP-20067615-JC-01En

IONIC+ Permanent Antimicrobial: Extruded Filament

120 gsm Knitted Fabric / 91% Nylon, 9% IONIC+

**TEST RESULTS**

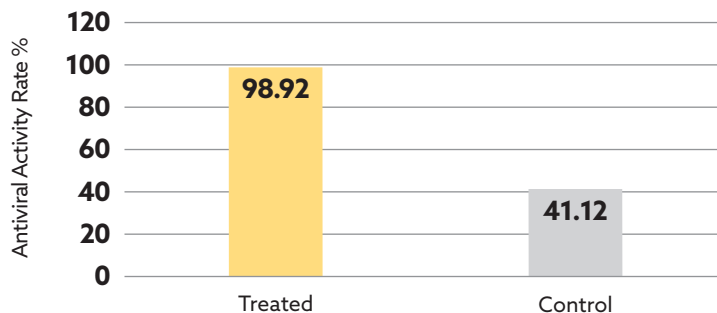
3X BETTER THAN CONTROL
AT REDUCING VIRUS VIABILITY

Test Method: ISO 18184

Test No: WP-20056185-JC-02En

IONIC+ Permanent Antimicrobial: Extruded Fiber

39 gsm Nonwoven Fabric / 100% Nylon with IONIC+ MB

**TEST RESULTS**

2X BETTER THAN CONTROL
AT REDUCING VIRUS VIABILITY

Test Method: ISO 18184

Test No: WP-20056185-JC-04En

Disclaimer: In the USA, IONIC+ is EPA registered as an antimicrobial material preservative. As such, according to EPA registration requirements, claims and end product marketing copy are limited to material preservation claims - protection of the fabric from bacterial and fungal fabric impacts associated with odor and staining. At this time, in the USA market, making viral claims to consumers is prohibited.

SILVER SOURCING AND RECYCLING

At NOBLE, we understand the importance of silver recovery and recycling for sustainable resource utilization, and how much this issue matters to our partners and greater community.

Evidence of our commitment to sustainable practices, we've implemented a number of internal Silver Recovery Initiatives. Additionally, our experience and expertise is available to Partners wishing to develop and launch similar programs.

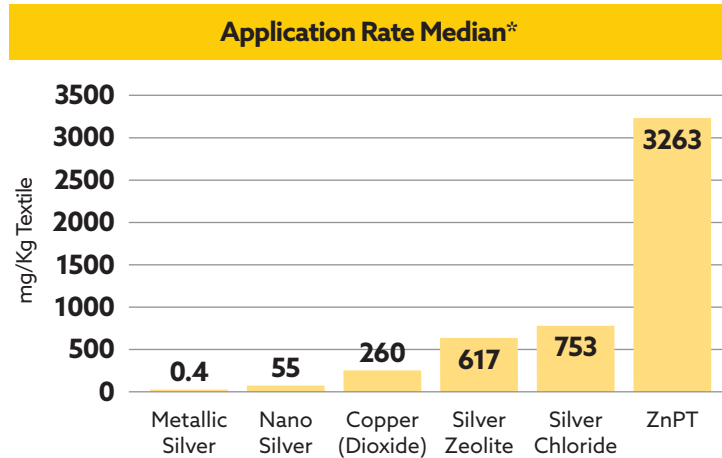
Our longstanding relationship with our silver suppliers is based, in part, on their promise to source from select primary and secondary silver recovery and recycling processes.

This commitment provides us continued access to high purity silver without compromise.

BETTER PRACTICES = A CLEANER PLANET

IONIC+® USES FEWER NATURAL RESOURCES

Although various metals can be used, IONIC+ is by far the most efficient way to achieve antimicrobial efficacy.



* Windler et al., 2013, Udin, 2014 and Turalija et al., 2015

SUSTAINABLE BENEFITS



SAVE ENERGY AND USE LESS WATER

As IONIC+ antimicrobial technology inhibits odor-causing bacterial growth, apparel can be laundered less frequently.



INVEST IN LIFELONG DURABILITY

Ionic+ Permanent technologies are permanently bound to the yarn and fabrics, ensuring the functionality stays intact for the life of the product.



SKIP THE SYNTHETICS AND GO MINERAL

IONIC+ technologies are based on the power of elemental silver...nothing not of this earth and zero nanotechnology.



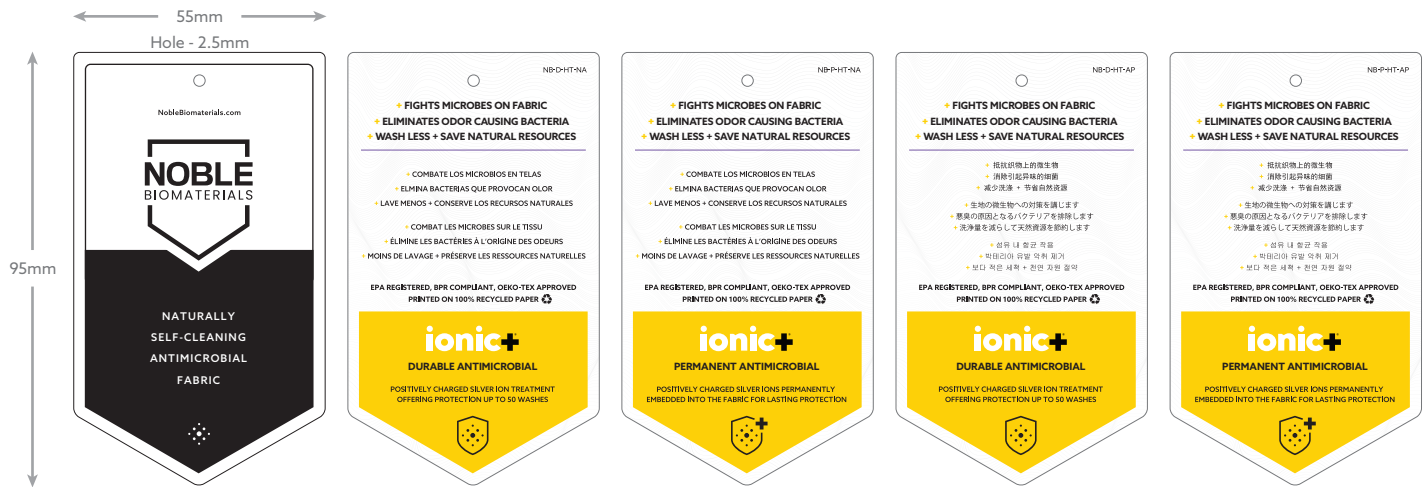
CHOOSE A RECYCLED OPTION

Upon request, IONIC+ can be made with recycled polymers to suit your specific application.

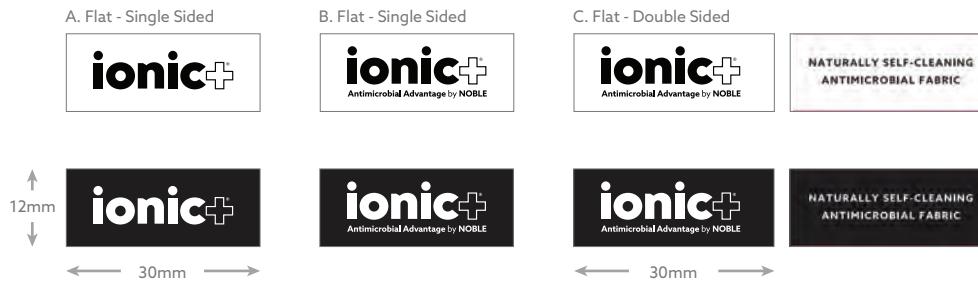
IONIC+® BRAND SUPPORT FOR ALL END USE PRODUCTS*



HANGTAGS One universal, multilingual tag for all products in all sizes, printed on 100% recycled paper



PRINTED FABRIC LABELS A universal label: three styles, positive and reverse designs



HEAT TRANSFERS A universal emblem: three styles, positive and reverse designs



* Additional languages for Asia available upon request. Brand support is complimentary on orders that are placed 60 days before in-hand date.

NOBLE REGULATORY AND AFFILIATIONS



US FOOD & DRUG
ADMINISTRATION
510(k) Medical
Device Clearances



EUROPEAN COMMUNITY
CERTIFICATION
Used in Customer-Cleared
Class 1, 2 and 3 Medical
Devices



US ENVIRONMENTAL
PROTECTION AGENCY
Antimicrobial Registrations



OEKO-TEX®
Standard 100
Certification



BLUESIGN
System Partner

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NOBLE Biomaterials is a global leader in antimicrobial and conductivity solutions for soft-surface applications. The company produces advanced material technologies designed for mission-critical applications in the performance apparel, healthcare, industrial, and emerging wearable technology markets. Its flagship brands, X-STATIC®, IONIC+®, and CIRCUITEX®, are used by world-class licensees to provide odor elimination, infection prevention/management, biometric monitoring, and conductive protection benefits. Our headquarters and manufacturing facilities are located in Scranton, Pennsylvania, and we have a network of offices across Europe, Asia, and South America. Visit our website to learn more.



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