NOBLE BIOMATERIALS

Stealth Technologies

Conductive Shielding Solutions
for a Strategic Advantage

Noble Biomaterials

Conductive Fabric Shielding Solutions for a Low Observable Strategic Advantage

Noble Biomaterials provides superior solutions for warfighter uniforms, equipment, aircraft, ships, submarines, vehicles, missiles, and satellites that need to be less visible to radar, infrared, sonar and other detection methods. Low observable technology materials made by Noble Biomaterials are used by the best in military and aerospace, including US and Allied Special Forces, Lockheed Martin, Northrup Grumman, Boeing, and NASA.

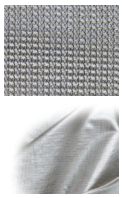
Overview of Multi-Spectral Shielding in Textiles

EMI, RFI, and IR spectrum concealment fabrics and soft surface materials from Noble Biomaterials are effective solutions for lightweight, flexible and portable multi-spectral shielding applications where failure is not an option. These fabrics and materials are effective in the visible light, infrared, and radar portions of the EM spectrum.

Uses include:

- Multi-spectral fabric for uniforms to hide IR signature
- EMI shielding for tents and shelters
- High-altitude electronic shielding
- High-temp shielding for surface to air missiles
- RFI gaskets
- Data protection bags and pouches
- Tow targets
- Missile transportation shielding bags
- Pressure mapping solutions
- Cable shielding
- Biosensing garment solutions

Fabric Metallization Technology

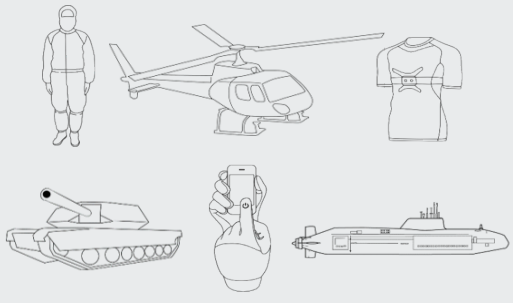


Noble Biomaterials uses proprietary technology to permanently bond pure silver to the surface of a polymer substrate, including yarn, fiber, fabric, tape, and foam. These materials can be blended with natural or man-made fibers for superior design flexibility. Special formulations can protect against galvanic reactions and oxidization. The result is a highly conductive, durable, lightweight, flexible, washable material with 360-degree permanent encapsulation coating. Noble Biomaterials provides industry-leading performance, quality control, and durability.

Conductive metal over flexible polymer

Customization Options Are Virtually Unlimited

Noble acts as an end-to-end partner by integrating its technology materials and providing development consulting, ideation, quality assurance, and regulatory compliance tailored to your application. Noble customizes specifications to deliver pliability, tenacity, elongation, and strength per the customer.



MULTI-SPECTRAL FABRIC FOR IR SIGNATURE REDUCTION

Noble Biomaterials' multi-spectral shielding materials can improve performance, decrease noise detection, reduce weight, improve comfort, and increase portability for warfighters. These materials provide unmatched consistency and performance in shielding effectiveness, decibel reduction, Z-axis electrical and thermal conductivity, and softness and flexibility.

Noble Biomaterials Low Observable Fabric Compared to Regular Uniform Fabric.

Noble Biomaterials' multi-spectral shielding materials:

- Increase thermal diffusion and reduce thermal signature so the user can assimilate in any terrain
- Provide static & dynamic thermal concealment
- Offer protection in the complete thermal range of 3000-5,000nm (MWIR) and 8800-12000nm (LWIR)
- Easily integrated on standard textile manufacturing equipment

Noble Biomaterials Multi-Spectrum Shielding Technology is currently in uniforms and over garments on the most elite special teams in US and allied forces.

Performance laboratory test results are available upon request.

EMI AND RFI SIGNAL BLOCKING TECHNOLOGY

Noble Biomaterials offers fabric, filament, and fiber solutions for lightweight, flexible, multi-spectral shielding to protect data transmission networks and electronics from interference or interception. It is effective in the visible light, infrared, and radar portions of the EM spectrum. Shielding performance can be tailored to meet customer requirements by use of different fabric constructions, additional coatings, or multiply plies.

These materials are easy to integrate, can be processed on standard textile manufacturing equipment, perform to exacting specifications, and can be utilized in a wide range of commercial and industrial applications.

- Vehicle and HVAC control systems
- Medical equipment
- Infrastructure, power; and communications
- Radio frequency interference for electronics such as displays, computers, cell phones, tablets, GPS devices, drones, etc.
- Electromagnetic interference shielding for cable assemblies
- Electrostatic discharge protection
- Lightweight electrical pathways for low voltage power transmissions

Noble Biomaterials Shielding Provides Unmatched Consistency and Performance In:

- Shielding effectiveness across a broad range of frequencies (30-90+ dB reductions)
- Surface resistivity from 10^9 to 5^{-3} Ω/□
- Static dissipation between 1.0^5 to 1.0^9 Ω/□
- Z-axis electrical and thermal conductivity
- Durability and flexibility

Frequency Ranges

Noble Biomaterials provides flexible shielding protection from 30 MHz through 30 GHz range of the electromagnetic spectrum and attenuation values between 30 dB (99.9%) up to 90 dB (99.9999999%).

Technical Benefits

	Protect	Detect/ Transmit	Protect
Function	ESD	Conductance	Shielding
Application	Static Control	Data Transmission	Data Protection
Conductive Range	1.0x1011 Ω/In	1-20 Ω/In	1.0-5.0-3 Ω/□
Product Example	Spun Yarn	Continuous Filament	Fabric

EMI/RFI SELF-STICK SHIELDING PRODUCTS

Whether you're shielding a room for secrecy, testing equipment, or segregating data, EMI/RFI self-stick shielding technology from Noble Biomaterials offer simple, fast, and flexible solutions to securing spaces large or small. Specifically designed for implementation in environments where time and manpower are at a minimum, but security is paramount. The system is engineered to be as easy to install as self-adhesive wallpaper, with all the shielding effectiveness of complicated foil installations. The material is available in several configurations for various performance specifications. Each product can be installed by one or two people with little or no formal training yet will meet exacting shielding requirements of your project.

Benefits of Noble Biomaterials EMI/RFI Self-Stick Shielding Products

- Can be used in any space that needs to be secured, from an airplane hangar to a closet or a transportation case.
- Far more effective than films and as effective as foils with drastically reduced installation time and cost.
- Very little to no down time needed in the space for installation.
- Simple installation with no soldering or other complicated seaming; one to two people can complete a room.
- Products are textile based for weight saving, flexibility, and durability.
- Can be assembled to meet your specific program requirements.
- Made in the USA.

Appropriate for Telecom, Big Data, Government (Embassy, Federal Police, DOD), Information Technology, Manufacturing, Aerospace, and Automotive and more.

Environment and Applications

Noble Biomaterials self-stick shielding products were originally designed so that an organization could secure an existing room, building, or portable enclosure in an efficient manner that would not disrupt the operation for an extended period or alert people in the vicinity to the work being performed. In typical shielding installations, the installers have difficult materials to work with and the process requires a great deal of time in the space, rendering it useless. With Noble self-stick shielding products, an installer could literally apply the shielding while the space is in use.

The system is designed to be applied to a wide variety of surfaces including unfinished dry wall, cinder block, concrete, plastic, painted or finished walls, painted and unpainted metal, and even low energy composite structures and cases. The system can also be encapsulated between layers of dry wall, plywood, or other construction material to avoid potential damage, provide additional protection from the elements, or to make it undetectable from parties that may enter the secured area. Because the adhesive can also be conductive, sending metal screws through the material will not create leaks. The adhesives have been tested for their ability to adhere to virtually any surface found in temporary or permanent structures.

Noble Biomaterials EMI/RFI self-stick shielding products can also be used to improve the performance of storage containers and other deployable assets. Because the materials are fabric based, they have a natural ability to move with the structure and will not crack, split, or suffer from many of the same problems that more traditional architectural shielding products tend to face in portable or deployable structures.

Production Capabilities

Noble Biomaterials is already a trusted supplier of mission-critical products in shielding, conductivity, dissipation and antimicrobial applications and currently has advanced material technologies in use with US and allied militaries and government bodies as well as the top global aerospace companies in the world.

Noble Biomaterials EMI/RFI self-stick shielding products are all manufactured and assembled in our US facility with the highest level of quality control. The Fabrics and Adhesives are all readily available, are standard items and in inventory. Utilizing the current processes and equipment, on a single shift it is possible to produce this material at a rate of 500 to 1000 linear yards per day. We can easily increase capacity with very little ramp up time. The material is produced in roll form and provided in various widths to allow for ease of installation.

IN ADDITION TO STEALTH TECHNOLOGIES, NOBLE BIOMATERIALS OFFERS A LARGE RANGE OF ADVANCED MATERIAL SOLUTIONS

Antimicrobial Wound Care and Soft Surface Infection Protection

X-STATIC® is used in the healthcare market to provide clinical-quality antimicrobial performance. Manufacturers of advanced wound care products incorporate X-STATIC into various medical devices, including Class II and Class III advanced wound care treatments, dressings, medical socks, and orthopedic soft goods.

Manufacturers of healthcare apparel and textiles also incorporate X-STATIC into soft surfaces, such as privacy curtains, scrubs, lab coats, patient apparel, and bedding to prevent the growth and cross-contamination of bacteria on the surface of fabrics. X-STATIC protects the fabrics surrounding patients and staff in the healthcare environment.

Bactericidal Fiber and Filament for Odor Management

X-STATIC provides permanent anti-odor capabilities by inhibiting the growth of bacteria and fungi on garments that cause odors. By inhibiting growth of bacteria and fungi on the surface of fabrics, X-STATIC keeps apparel odor free, even after multiple wear cycles between washings. Noble Biomaterials has tested products powered by X-STATIC under rigorous, real-world conditions and is proven to last the life of the product.

XT2 utilizes the power of silver ions to provide permanent odor management by inhibiting the growth of bacteria and fungi on fabrics that consume sweat and cause odors. In doing so, XT2 keeps apparel stink free all day, every day.

Conductive Materials to Detect, Transmit, Protect

Circuitex® fabric is highly effective at conducting electricity, dissipating static and providing EMI shielding in applications where data transmission networks and electronics require protection from interference or interception. Circuitex is an ideal solution to create sensors that are lightweight, flexible, easy to install and performs to exacting specifications in the most demanding applications.

Fabric Sensors and Pathways for Biometric Monitoring

Nothing transmits a signal better than silver. With 100% surface area coverage and uniform conductivity, CIRCUITEX uses the permanently bound silver to transmit small electrical signals from the body. A flexible substrate, CIRCUITEX technology helps make garments smarter and more comfortable, while providing the critical information to understand how a body is performing without uncomfortable hard materials.

Protecting signals is a critical function in a smart garment system. CIRCUITEX fulfills a key role in warding off signal degradation. Utilizing permanently bound silver providing 100% surface area coverage and flexibility, designers can achieve uniform conductivity for predictable results.

Heated Fabrics

As silver is the most thermally conductive element on Earth, it works well as the technology enabling heated fabrics. These intelligent wearable electronic textiles can now be light and comfortable with Circuitex as the conductive base. Applications include apparel, gloves, insoles, wetsuits, etc.

NOBLE BIOMATERIALS APPLICATIONS

Fabric

Noble Biomaterials has the unique ability to both metallize fabrics and to weave fabrics to specifications depending on the application and customer requirements.

Metallized fabrics includes wovens, warp knits, circular knits and non wovens. Full width fabrics (up to 64”) wide can be metalized by Noble with wider width fabrics available upon special request.

These fabrics can be integrated into just about any specification. Varying levels of conductivity as well as variable conductive pathways can be engineered which provides significant flexibility while building advanced materials. End use applications include but are not limited to: EMI shielding, low observable, heating, anti-static, industrial, healthcare, health and wellness and military products.

Fiber

Typically, short fibers (which are usually measure up to 0.5” in length) are known as chopped fiber. Advantages of X-STATIC chopped fiber includes the versatility to blend with excellent dispersion in the finished product, as well as the ability to be easily incorporated into blowing foams. Standard sizes available for chopped fiber include 3dpf x 30 mils, 3 dpf x 20 mils and. 1.8 dpf x 200 mils.

Foam

Noble manufactures metallized foam products for use in FDA-approved medical devices. The foam is produced with a universal 3-Dimensional coating of pure metallic silver, providing for optimal silver ion release, excellent reduction kinetics, long-term sustained performance, and true flexibility.

Filament

Filament yarns are continuous filaments. They can be monofilament or multifilament in most of the commonly used deniers.

Staple

Staple fibers are short fibers that are not continuous filaments, which are usually greater than 0.5” and up to 7” in length representing various deniers. Some advantages of staple include the ability to be blended with other natural and man-made fibers. They also cover a very high surface area, which enables use of smaller amounts of the technology for a given application. And they can be handled as regular textile product—be opened, carded, and spun into yarn, as well as be relied on for durability.

US Environmental Protection Agency
Antimicrobial and Conformance Registrations

European Community Certification
Class 1, 2 & 3 Medical Device Approvals

Oeko-Tex
Standard 100 Certification

Underwriters Laboratory

Bluesign®
System Partner

Further Information

To submit your RFQ or request a needs analysis, contact Bennett Fisher.

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Noble Biomaterials is an advanced materials innovator dedicated to improving lives by harnessing the power of pure silver to deliver transformational functional benefits.

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