



Lasco International Group®

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The Armoring Process

Once a vehicle and deposit has been received, a work order is put into effect describing the materials and levels of protection that have been requested by the owner of the vehicle.

1. The first step is to completely dismantle the interior of the vehicle, which is to say that once this is done, the vehicle is basically just a frame, which allows the work to begin. Meanwhile all the interior parts of the vehicle are removed and assigned the same number as the vehicle and stored with the intention that no parts are misplaced when needed again in the final stages.
2. The next step is to take measurements of the floor, roof, doors, and firewall in order to fabricate the pieces needed to cover the areas. During this phase the gas tank is removed and protected with Ballistic Nylon and covered with a water-resistant coating. The suspension and braking systems of the vehicle are evaluated then modified to withstand the added weight.
3. The next step is to place the opaque armor in the vehicle; this armor is Spectra® Shield specially manufactured with Ballistic properties. The Spectra Shield is a polyethylene that is a very lightweight-armoring product. It is the most advanced product that is used to armor airplanes, automobiles, helicopters, vests, etc. It is very lightweight, resistant to moisture and acids. In its commercial form it is used as a retardant to combustion. Piece by piece it is cut to fit in order to install carefully into doors, pillars and/or posts, back doors or behind rear seats to give the occupants of the vehicle optimum protection. The battery is then protected with steel. The materials used in the windows are a combination of glass and polycarbonate which should be made to fit OEM window channels to give the vehicle a perfect factory finish.

The modifications for the options are worked in during the entire process. All the final details are noticed and finished so that we can achieve the original appearance of the vehicle so that the vehicle will go undetected as an armored automobile.

The bullet proofing process is done with the highest precaution so that the protection and security as well as the comfort of the client are assured once the product is finished. The

windows utilized are custom made in order to accommodate any vehicle with minor adjustments to the frame.

4. The final step is to replace the interior just as it was received, with other minor adjustments. Our technicians give priority to conserve the luxury and beauty of the details of the vehicle even though they have installed materials that are required in order to provide maximum protection.

LASCO Group warrants the client that the armor used is made in the United States of North America and that it will remain free of defects of materials or labor for 12 months from the date of modification. If it is necessary to perform repairs, LASCO Group can do these repairs in any part of the world. Maintenance is also offered after the warranty has expired.

Details

There are various ways to work with our company. The first and most common way is that the client provides a vehicle that is to be armored. In this case the client needs to only provide LASCO Group with 50% of the price of the armor and balance will be paid when the vehicle is finished. The second way is to have LASCO Group provide the vehicle that the client desires to armor. In this case the client need to pay 100% of the price of the vehicle and 50% of the price of armor. The balance would be paid when the vehicle is finished.

When the balance is received. LASCO Group will deliver the vehicle anywhere within the U.S.A. that the client desires. The client only pays their countries import tax of the cost of armor.

Performance Report

A technical and information source covering ballistic armor developments around the world

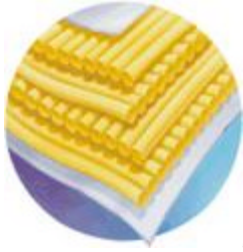
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Introducing Spectra and Spectra Shield Ballistic Materials

With violent crime and military intervention on the rise around the world, protective armor for both people and equipment has become critical. Today, the threat is from high-capacity, semi-automatic weapons, which have the ability to fire multiple round from all angles. To give their products a performance advantage, the world's leading armor manufactures are specifying new generation of ballistic materials from **Spectra®** fiber and **Spectra Shield®** composite.

What is Spectra?

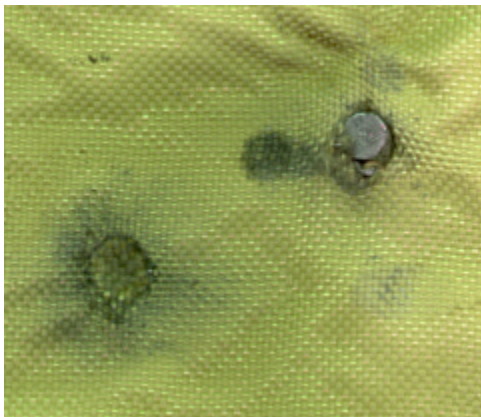
Spectra is the strongest man-made fiber in the world, 10 times stronger than steel. A very light material, it floats on water and maintains reliability when wet. It also resists chemicals, abrasion and cuts.



Spectra® high-performance fiber can be woven into a fabric or formed into a thin ballistic “sandwich” called Spectra Shield®

There are two types of Spectra Shield®, PCR for hard armor and LCR for soft armor. Both are created in an proprietary “unidirectional” process, which enhances the ballistic performance of any base fiber. To make PCR, Spectra fibers® are aligned at 90° angles, then held in place with a resin or “glue.” LCR is formed by adding a layer of polyethylene to the top and bottom. This patented “unidirectional” technology also has been licensed to DSM in Holland.

Spectra Shield® has a 33 percent advantage over woven aramids in blunt trauma, the sometimes deadly hammer-like blow to the body from a stopped bullet. This was demonstrated in tests certified by the United States government at H.P. White Laboratories, the country’s leading independent testing lab.



Fabricating, Processing and Machining

Introduction

This paper provides recommendations and guidelines for the machining, processing and fabricating of Spectra® Fiber Reinforced Composites.

Spectra® high performance fibers, ultra-high molecular weight polyethylene fibers from Inc., possesses a combination of properties that make them ideal reinforcement materials in composites for a wide variety of applications.

They are the lightest high-strength fibers, with a density of 0.97. They are chemically inert, virtually unaffected by long immersion under high hydrostatic pressure, and absorb very little water. They have a very low dielectric constant (2.2), and are highly transmittable to acoustic signals.

Continuous Spectra® fibers come in two forms: Spectra® 900 and Spectra® 1000. Spectra® 1000 is a stronger version of the 900 series and has a tensile strength of 435×10^3 psi (3.0 GPa) and a tensile modulus of 25×10^6 psi.

Spectra® composites can be made from Spectra® fibers, fabrics or from Spectra Shield® ballistic material.

Spectra® fibers can be filament-wound into ballistic pressure bottles and containment vessels.

Spectra® fabrics are available in a variety with or without post-treatments for adhesion. Spectra® fabrics can be used for soft and molded ballistic armor as well as for other molding operations in the composites industry.

Spectra Shield® material is a patented, non-woven ballistic armor technology incorporating Spectra® fibers in a unidirectional resin matrix. Spectra Shield® material provides improved ballistic protection over woven systems for both rigid and flexible armor.

For engineers who are considering the use of Spectra® fibers in composites, we offer the following suggestions.

Resin Selection

A variety of commercial 250°F temperature cure resins can be used with Spectra® fibers without modification. Vinyl ester resin systems give superior impact properties, while epoxy resin systems translate better structural properties, and polyester resin systems provide greater economy. One example of each is listed below.

Product	Resin	Supplier
Vinylester	Derakane 411-45	<u>Dow Chemical Co.</u> Midland, MI 48674 Tel: 517-636-1000/800-258-2436
Epoxy	Epon 826	<u>Shell Chemical Co.</u> 1415 West 22 nd Street, Oak Brook, IL 60521 Tel: 800-323-3405
Isophthalic Polyester	Aropol 7240	<u>Ashland Chemical Co.</u> Polyester Division P.O. Box 2219 Columbus, OH 43216 Tel: 614-889-3333

Consult manufacturer for recommended curing procedure.

Prepregs

Prepregs is available through major commercial prepreggers, in both fabric and unidirectional form. Resins can be either thermoset or thermoplastic.

The following is a list of typical thermosetting prepregs, and their suppliers. Prepreg is available in plasma-treated or non-treated form.

Product	Resin	Supplier
Epoxy	948A1	<u>Fiberite Corporation</u> Advanced Materials Business Group ICI Americas, Inc. Wilmington, DE 19897 Tel: 302-886-3000
	RS-1	<u>YLA, Inc.</u> 4050B Pike Lane Concord, CA 94520 Tel: 415-685-0995
Polyester	F149-522	<u>Hexcel</u> 11711 Dublin Blvd. Dublin, CA 94566 Tel: 415-828-4200
Vinylester	TC809	<u>Westinghouse Electric Corp.</u> Bedford, PA 15522 Tel: 814-623-9014

Contact prepregger for details of curing and actual use.

Processing Techniques

Spectra® fibers and fabrics can be used in wet and hand layup, prepreg layup, filament winding, pultrusion, and resin transfer molding processes. For layup techniques, both vacuum bagging and matched metal die molding have been used. For hand layup, we recommend using a low-viscosity resin (300-700 centipose), because unlike aramids, Spectra® fibers have wet-out characteristics similar to glass, and becomes translucent when wet. Curing, post curing, and/or molding temperature should be kept below 250°F.

Example#1: Process conditions for a 903 modified vinylester prepreg

Hold at 240°F for 20 minutes at 550psi (for a 1 to 2 lb/ft² laminate); lower pressures in the range of 100psi are possible; confirm performance with sample testing.

Typical wet layup process procedures are:

1. 1. Cut fabric into 12" × 12" samples. Twenty-six pieces of a Spectra® 900 plain weave, 7.0 oz/yd² fabric (Style 903), with a fiber areal density=1.26 lb/ ft², will yield a composite areal density = 1.6 lb/ ft².
2. 2. Preheat press to 224°F.
3. 3. Use the following resin formulation: Mix thoroughly 700g of Dow Derakane 411-45 vinylester resin with 0.7g CoNap (6% solution). Add 5.25g of MEKP (9% active oxygen). Mix thoroughly.
4. 4. Spread a 14"×14" release film on work area (Mylar or Teflon recommended).
5. 5. Apply a layer of resin mix.
6. 6. Place a layer of fabric on resin.
7. 7. Cover fabric with a layer of resin.

8. 8. Alternate fabric and resin in this manner until all 26 layers have been used, and a release film added.
9. 9. Press at 200psi and 224°F for 40 minutes.

Example#2: Spectra Shield® Process Conditions

Spectra Shield® material is an proprietary product, consisting of 2 plies of unidirectional Spectra® fibers bonded in a 0°/90° orientation. It is provided in roll form, [0,90], 54” wide, weighing 3.8 oz/yd², or 0.026 lb/ft² per ply.

Typical Procedure is:

1. 1. Unroll and cut patterns to desired size or shape.
2. 2. Stack to desired total areal density:

Areal Density (lb/ft ²)	#Plies
0.5	19
1.0	38
5.0	186

3. 3. Place stacked plies in mold.
4. 4. Process according to Figure 1. The amount of time is related to panel thickness. Typically, a 1 lb/ft² panel takes 30 minutes and a 5 lb/ft² panel takes an hour. Equipment should be calibrated via temperature measurements.

Figure1: Processing of Spectra Shield material

- • Do not exceed 250°F.
- • Apply constant pressure (100-150psi) throughout cycle, Heat Up—Hold—Cool Down.
- • Cool down to 150°F under pressure.
- • Calibrate equipment for a complete cycle using a thermocouple.
- • Temperatures given are the panel core temperatures. Platen temperatures may be hotter due to heat transfer.
- • Ramp Up (X) and Ramp Down (Y) times and temperatures depend panel thickness and equipment.
- • Confirm panel performance on a routine ballistic testing basis.

Adhesives

The following is a list of suppliers of adhesives recommended for adhering Spectra composites to other composites, or to metals and/or ceramics.

Adhesive	Product Name	Supplier
Thermoplastic Elastomer	Composigrip-S	<u>Composiflex</u> 2101 Peninsula Drive Erie, PA 16506 Tel: 814-833-8141
Polysulfide Rubber Compound	Pro-Seal 890	<u>Product Research & Chemical Corp.</u> 5430 San Fernando Road

		Glendale, CA 91209 Tel: 818-240-2060
Rubber & Gasket Adhesive	1300	<u>3M Adhesives</u> Coatings and Sealers Div. St.Paul, MN 55144 Tel: 612-733-1110 Oper. 55
Urethane Elastomer	Calthane NF 1300	<u>Cal Polymers, Inc.</u> 2115 Gaylord Street Long Beach, CA 90813 Tel: 213-436-7372
Epoxy	EC-3448 Structural Adhesives	<u>3M Aerospace</u> Material Department St.Paul, MN 55144 Tel: 612-733-1110 Oper.55

Machining

Cutting

Because of their extremely high strength and abrasion resistance, Spectra® fibers and fabrics are difficult to cut by conventional methods. Dry fabrics can be cut with carbide blade shears, power shears, or rotary shears. In addition, the low melting point of Spectra® fiber allows the use of hot knife and hot wire cutting techniques. For prepregs and laminates, water jet cutting with or without abrasives, laser cutting, and techniques such as band saw and circular saw offer economical ways to cut fully cured laminates.

Polishing and Finishing

Spectra® high performance fibers offer high abrasion resistance. That makes the job of finishing Spectra® composites relatively difficult. For a highly polished surface, use a thin layer of resin-impregnated glass or carbon veil on the outside of the Spectra® fiber. When outside dimensions are not strictly controlled, gel finishing can be done as a secondary operation.

Drilling

If drilling is required in the final assembly stage, Deep-Fiber-Cut drills (a trademarked product of international Carbide Corp.), or Core Drills for composite materials, are recommended for drilling fuzz-free holes. For further information, contact your Fibers Technical representative.

Spectra Product	Tool	Model#	Supplier
Fabric & Prepreg	Shears	WR12C-6	<u>Pen Associates</u> 2639 W. Robin Drive Wilmington, DE 19808 Tel: 302-239-6866
	Power Shears	WR580 Shear Head: WR80-20WC	<u>Pen Associates</u> 2639 W. Robin Drive Wilmington, DE 19808 Tel: 302-239-6866

	Fiberglass Reinforced Cutoff Wheel	426	<u>Dremel</u> P.O. Box 081126 Racine, WI 53408-1126 Tel: 414-554-1390
	Circular Knife (large)	59	<u>H. Maimin Co., Inc.</u> P.O. Box 549 Kent, CT 06757 Tel: 203-927-4601
	Circular Knife (small)	Chickodee II Type D2	<u>Eastman Machine Co.</u> 779 Washington Street Buffalo, NY 14203 Tel: 716-856-2200
	Hot Knife (Also used for Composites)	Engel Heat Cutter Type HSGO 110V 70W 50-60Hz Cutting Blade Type 100R	<u>Brian Lyttle, Inc.</u> P.O. Box 2665 Station A Sparanburg, SC 29310 Tel: 803-583-8436
Composites	Brand Saw	18 TPI (no pitch) 1/2" width @ 1500RPM	Local hardware suppliers
	Straight Knife	All models	<u>J. Dashew Inc.</u> 2709 Frederick Avenue Baltimore, MD 21223 Tel: 800-638-3170
	Water Jet	All models	<u>McCartney Mfg. Co.</u> 635W.12 th Street Baxter Springs, KS 66713 Tel: 316-856-2151
	Laser Jet	All models	<u>Flying Machines Inc.</u> 2029 Research Drive Livermore, CA 94550 Tel: 415-447-0656
	Drills	Deep-Fiber-Out Drill	
Core Drill			<u>McMaster-Carr Supply Co.</u> P.O. Box 440 New Brunswick, NJ 08903 Tel: 201-329-3200

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