



POLYCOR®

945 Series

Unsaturated Polyester Tooling Gel Coats

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Type

945 Series tooling gel coats include both unsaturated polyester and vinyl ester products. The information below is for the unsaturated polyester products. Information on the vinyl ester products can be found on DS-45G POLYCOR® 945 Series Vinyl Ester Tooling Gel Coats (945BJ115 Black and 945YJ071 Orange).

Description

POLYCOR® 945 Series Unsaturated Polyester Tooling Gel Coats are specifically formulated for mold making. These precision-formulated gel coats provide high gloss, durable surfaces to withstand the repeated moldings of FRP laminates.

POLYCOR® 945 Series Unsaturated Polyester Tooling Gel Coats are formulated ready-to-spray after the addition of the proper amount of an appropriate methyl ethyl ketone peroxide catalyst. They are formulated to be low in hide so that imperfections can be easily spotted.

The POLYCOR® 945 Series Unsaturated Polyester Tooling Gel Coats include the following products:

Type	Product Code	Conventional Spray	Airless
Unsaturated Polyester	945B201	Yes	No
	945B023 ¹	Yes	Yes
	945GA104	Yes	Yes
	945YA058	Yes	Yes

¹See DS-45C POLYCOR® 945B023 Conductive Black Tooling Gel Coat for more information on this product.

Features and Benefits

- High gloss surface
- Excellent abrasion resistance for long mold life
- Good temperature resistance to withstand repeated molding cycles.
- Good strength and flexibility for durability and crack resistance
- User friendly application



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Typical Properties (at 77°F)

Liquid properties of POLYCOR® 945 Series Unsaturated Polyester Tooling Gel Coats are shown below. These values may or may not be manufacturing control criteria; they are listed for a reference guide only. Particular batches will not conform exactly to the numbers listed because storage conditions, temperature changes, age, testing equipment (type and procedure) can each have a significant effect on the results. Products outside of these readings can perform acceptably. Final suitability of this product is in the end use performance.

Test	945B201 Black	945YA058 Orange	945GA104 Green
Viscosity	17,500 cps	17,500 cps	17,500 cps
Thixotropic Index	7.0	7.0	7.0
Hazardous Air Pollutants	See MSDS	See MSDS	See MSDS
Volatile Organic Compounds	48.1%	46.5%	47.1%
Weight per Gallon	9.03 lbs.	9.11 lbs.	9.06 lbs.
Flash Point	82°F	82°F	82°F
Gel Time ²	20 minutes	20 minutes	18 – 23 minutes
Lay-up Time	60 – 90 minutes	60 – 90 minutes	60 – 90 minutes
Barcol Hardness ³	40	40	40
Ultimate Barcol	40	40	40
Hide Complete (wet)	21 mils	28 mils	29 mils
Heat Distortion Temperature ⁴	181°F (82.8°C)		

¹Brookfield RVF #4 Spindle @ 4 rpm

²100 g mass, 1.8% Arkema Luperox® DDM-9

³Barcol Hardness determined on a casting made as follows: adjust the tooling gel coat to 77°F, catalyze 100g with 1.8% Arkema Luperox® DDM-9, weigh 50 grams into a 160 ml aluminum weighing dish (4 in. diameter), keep the dish on an insulated surface, and maintain 77°F ambient temperature for 75 minutes. Check the hardness of the cured casting with a 934 Barcol impressor. (Barcol cannot be checked on a gel coat film because the cured film is too thin. The barcol impressor penetrates the film and reads the hardness of the substrate behind.)

⁴HDT was determined using an internal CCP test method that is similar to ASTM D648. The test was run on a neat resin casting (approximately 0.125 in thick) made by catalyzing the gel coat with 1.8% Arkema Luperox® DDM-9. The gel coat casting was cured for 16 hours at room temperature and was post cured for 6 hours at 150°F.

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Application

Application guidelines for POLYCOR[®] 945 Series Unsaturated Polyester Tooling Gel Coats are provided below. See CCP's [Composites Applications Guide](#) for additional information on all phases of mold fabrication.

POLYCOR[®] 945 Series Unsaturated Polyester Tooling Gel Coats should be mixed prior to use. Use mixing equipment with sufficient horsepower (relative to container size) to achieve thorough circulation from top to bottom and out to the sides of the container. The agitator must be properly sized for the container and must allow for uniform mixing regardless of the liquid level in the container. Mixing once a day for 10 minutes is typically sufficient. Air bubbling should not be used for mixing. It is not effective and only serves as a potential source of water or oil contamination. Do not over mix POLYCOR[®] 945 Series Gel Coats. Over mixing can break down the resin viscosity increasing the tendency to sag.

For best cosmetics and durability, CCP's recommends that molds be fabricated using one application of tooling gel coat (18±2 mils wet) followed by one application of CCP's ArmorGuard[®] 967 Vinyl Ester Barrier Coat (18±2 mils wet). ArmorGuard[®] 967 improves cosmetics by reducing fiber print and distortion. ArmorGuard[®] 967 also provides excellent heat resistance and toughness. Allow the tooling gel coat to gel and cure prior to application of the ArmorGuard[®].

If extensive sanding is expected, an alternative method is to apply two coats of tooling gel coat at 18 (±2) mils wet each. This provides a thicker a gel coat layer for reworking the mold surface. Allow the gel coat to gel and cure between coats. Do not use barrier coat if applying 2 coats of tooling gel.

POLYCOR[®] 945 Series Unsaturated Polyester Tooling Gel Coats are formulated for spray application. Conventional Air Atomized or pot gun application is recommended for best results. Brushing or rolling is not recommended.

Apply each coat using three passes with each pass having a thickness of 6 mils. More rapid film build could result in sag and porosity. For best results, ensure that the tooling gel coat is allowed to "breathe" for two minutes between each pass. Do not allow over-spray and thin passes to go beyond 5 minutes without covering with a fresh pass. Thin, independently curing films can create a textured effect when the surface is sanded and buffed.

Films less than 12 mils total wet thickness may not cure properly, may be hard to patch and have more print-through. Films above 24 mils may pre-release, trap porosity, and be more subject to cracking.

Application procedures for conventional air atomized and airless application are given below.

CCP urges customers to use strict quality control when applying tooling gel coat. Quality control checks to ensure proper application are very important, since many of the defects that result from poor application do not appear until the part has been removed from the mold.

In particular, CCP recommends that the customer include fabrication of a quality control panel as part of their quality control program. Fabrication and testing of this panel prior to actual mold fabrication allows you to verify the suitability of the product and your process. Fabricate the quality panel, by spraying catalyzed tooling gel coat over a test mold to a film thickness to 18 (±2) mils. Use the same equipment and settings as will be used for actual mold fabrication. Laminate behind the tooling gel. Once the laminate has cured, de-



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mold the panel. Sand and stain the gel coat and examine for entrapped air. These spray-outs should be saved along with other mold records.

Conventional Air Atomized

The following equipment is recommended:

Binks Equipment		DeVilbiss Equipment	
Fluid Nozzle	66 or 67	Gun	P-JGA-502
Air Nozzle	63 PB or 67 PB	Nozzle Combination	704-E
Needle	65 or 67	More than 17 C.F.M. required	
More than 13 C.F.M. required			

Airless (945-GA-104 and 945-YA-058 only)

While use of conventional air atomized equipment typically gives the best results, production requirements may dictate the use of airless equipment. Internal air-atomization spray equipment, airless, or catalyst injection spray equipment can result in porosity in the gel coat film if improperly applied. Tooling gel coats will not be as tolerant of inaccuracies in a catalyst injection system as are production gel coats. Proper spray technique is very important to eliminate porosity in the gel coat film.

The following are some steps to increase the chances of success when using airless equipment.

1. Calibrate daily or for each job:
 - a. Gel coat delivery of 1.5 to 2.5 pounds per minute.
 - b. Catalyst content--no less than 1.2% and no more than 2.4% (ideally 1.8% at 77°F).
 - c. Recommended gel coat tip size is .021 inches.
2. Ensure complete atomization and mixing of gel coat and catalyst. If air-assist is used, keep it as low as possible. Excess air-assist can result in trapping air in the film and sagging.
3. Do not let raw catalyst fall on the plug surface or on the sprayed gel coat.
4. Spray gun distance should be no less than two feet and no more than three feet.

Even with the equipment properly calibrated, potential problems can occur due to poorly atomized catalyst; surging problems (gel coat or catalyst); poor tip alignment (catalyst to gel coat mix); contamination; and poor application procedures. Equipment and application should be constantly monitored to maintain effective calibration, gel coat/catalyst mixing, and procedures. Ask about and adhere to all equipment manufacturers' recommendations.



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The table below is a trouble shooting guide for Airless application listing common problems and causes.

Problem	Cause
Spotty cure sticking	Due to improper concentration, atomizing or mixing of catalyst from incorrect calibration and malfunctioning injector slave pumps.
Porosity	Due to excessive air-assist; flow rates greater than 2.5 pounds per minute; more than 6 to 8 mils wet in one pass; no catalyst.
Low initial gloss	Incorrect catalyst calibration; under-cured gel coat film; raw catalyst sprayed on plug.
Gloss dulling	Due to under- or over-catalyzation, hence under-cured gel coat.
Uneven film thickness	Operator error; excessive surges during spray-out
Sag	Excessive air-assist; too thick of film; spraying too close to the mold.

The cure rate of polyester resins depends on a number of factors including the product's age, temperature, catalyst type, catalyst level and ambient humidity. For these reasons, we recommend that customer's check the cure rate in your plant.

All data referencing gel or cure refers specifically to Arkema Luperox[®] DDM-9 catalyst. Syrgis NOROX[®] MEKP-9 and NOROX[®] MEKP-9H, Akzo Nobel CADOX L-50a and CADOX D-50 are expected to yield similar performance. Arkema Luperox[®] DHD-9, NOROX[®] MEKP-925 and NOROX[®] MEKP-925H, and Chemtura HP-90 may yield slightly shorter gel and cure times.

To adjust for varying conditions the catalyst level can be varied. The catalyst level should not exceed 2.4% or fall below 0.9% for proper cure. A catalyst level of 1.8% at 77°F is considered ideal. For best results, it is recommended that the temperature be above 70°F.

To minimize pre-release and for best adhesion between the gel coat and laminate, POLYCOR[®] 945 Series Unsaturated Polyester Tooling Gel Coats should be laminated within few hours of application. The timing varies with temperature. Each customer should test under their specific shop conditions and with their specific materials.

Related Products

See CCP's Tooling and Support Products Guide for CCP's recommended tooling products including tooling gel coats, patching thinners, barrier coats, tooling resins and industrial cleaners.

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Precautions

Refer to the MSDS for handling precautions. MSDS's are supplied automatically with the first order for material, and are available by product code upon request from CCP's Regulatory Department, or on CCP's website at www.ccpcompositesus.com.

- Do not use varnish as a sealer or finish coat when preparing a plug, as the styrene in the gel coat will soften the varnish, even when well-waxed and coated with a parting film.
- Always keep the container covered (except, of course, when transferring material). An open container is easily contaminated and allows for more styrene evaporation.
- Never reduce tooling gel coat with a conventional paint or lacquer thinner, or acetone.
- Do not apply tooling gel coat over wet Polyvinyl Alcohol (PVA) parting film.
- Install an oil and moisture trap on the compressed air line leading to the spray gun to remove lint, rust, oil and moisture.
- Tooling gel coats may leave a certain amount of "coloring" when sanded and/or buffed. This is a function of the pigment used and is not an indication of cure.
- Do not add anything, other than the appropriate methyl ethyl ketone peroxide, to these products.

Storage

Uncatalyzed tooling gel coats have a usage life of 60 days from date of shipment when stored at 73°F or below in a closed, factory-sealed opaque container and out of direct sunlight. The usage life is cut in half for every 20°F over 73°F.

Data Sheets/MSDS

CCP data sheets and MSDS's are available in printable format at www.ccpcompositesus.com.

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COMPOSITES SAFETY INFORMATION (October 2011)

All sales of products manufactured by CCP Composites US (CCP), and described herein, are made solely on condition that CCP's customers comply with applicable health and safety laws, regulations and orders relating to the handling of our products in the workplace. Before using, read the following information, and both the product label, and Material Safety Data Sheet pertaining to each product.

Most products contain styrene. Styrene can cause eye, skin and respiratory tract irritation. Avoid contact with eyes, skin and clothing. Impermeable gloves, safety eyewear and protective clothing should be worn during use to avoid skin and eye contact. Wash thoroughly after use.

Styrene is a solvent and may be harmful if inhaled. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Extended exposure to styrene at concentrations above the recommended exposure limits may cause central nervous system depression causing dizziness, headaches or nausea and, if overexposure is continued indefinitely, loss of consciousness, liver and kidney damage.

Do not ingest or breathe vapor, spray mists or dusts caused by applying, sanding, grinding and sawing products. Wear an appropriate NIOSH/MSHA approved and properly fitted respirator during application and use of these products until vapors, mists and dusts are exhausted, unless air monitoring demonstrates vapors, mists and dusts are below applicable exposure limits. Follow respirator manufacturer's directions for respirator use.

The International Agency for Research on Cancer (IARC) reclassified styrene as Group 2B, "possibly carcinogenic to humans." This revised classification was not based on new health data relating to either humans or animals, but on a change in the IARC classification system. The Styrene Information and Research Center does not agree with the reclassification and published the following statement: Recently published studies tracing 50,000 workers exposed to high occupational levels of styrene over a period of 45 years showed no association between styrene and cancer, no increase in cancer among styrene workers (as opposed to the average among all workers), and no increase in mortality related to styrene.

Styrene is classified by OSHA and the Department of Transportation as a flammable liquid. Flammable products should be kept away from heat, sparks, and flame. Lighting and other electrical systems in the work place should be vapor-proof and protected from breakage.

Vapors from styrene may cause flash fire. Styrene vapors are heavier than air and may concentrate in the lower levels of molds and the work area. General clean air dilution or local exhaust ventilation should be provided in volume and pattern to keep vapors well below the lower explosion limit and all air contaminants (vapor, mists and dusts) below the current permissible exposure limits in the mixing, application, curing and repair areas.

Some products may contain additional hazardous ingredients. To determine the hazardous ingredients present, their applicable exposure limits and other safety information, read the Material Safety Data Sheet for each product (identified by product number) before using. If unavailable, these can be obtained, free of charge, from your CCP representative or from: CCP Composites US, P.O. Box 419389, Kansas City, MO 64141-6389; 816-391-6053.

FIRST AID: In case of eye contact, flush immediately with plenty of water for at least 15 minutes and get medical attention; for skin, wash thoroughly with soap and water. If affected by inhalation of vapors or spray mist, remove to fresh air. If swallowed, get medical attention.

Those products have at least two components that must be mixed before use. Any mixture of components will have hazards of all components. Before opening the packages read all warning labels. Observe all precautions.

Keep containers closed when not in use. In case of spillage, absorb with inert material and dispose of in accordance with applicable regulations. Emptied containers may retain hazardous residue. Do not cut, puncture or weld on or near these containers. Follow container label warnings until containers are thoroughly cleaned or destroyed.

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