



Technical Guide

ALESTA[®] POWDER COATINGS



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ALESTA[®] Powder Coating

General Information

THE CHOSEN FINISH[®]

Alesta[®] powder coatings' product line consists of premium formulations manufactured to meet performance specifications on a consistent basis. These powder coatings are designed to provide tough, durable, but highly decorative and functional finishes for virtually any metal finishing need. The standard chemistries are noted for their mechanical, chemical, and corrosion protection in a wide range of colors, gloss ranges, and surface effects.

Because powder coatings are virtually organic compound (VOC) free, the mass loss during cure coupled with good application techniques -such as maximized first-pass efficiency and reclaiming- can render excellent powder utilization. Clean-up and disposal considerations are less troublesome than those of wet painting.

Recent industry innovations have provided improvements in the standard Alesta[®] product line. Technological advancements have provided a full compliment of new chemistries, including high temperature resistant, graffiti and out-gas resistant, low energy, anti-microbial, post-formable, and weatherable wrinkle finish powders. All new DuPont[®] powder technologies are tested to assure maximum performance consistency upon commercialization. This provision makes DuPont[®] Powder Coatings a name that can be trusted.

GENERAL INFORMATION

SPECIFIC GRAVITY	1.2 to 1.8, formulation dependent.
THEORETICAL COVERAGE	110 to 160 sq.ft./lb./mil, formulation dependent.
STORAGE STABILITY	One year minimum at 75° F and 50% relative humidity.*
BULK DENSITY	Approximately 40-60 lbs./cu.ft.
PACKAGING	Heavy polyethylene bag in a corrugated carton, fiber drum, or bulk bag.

**Low cure and specialized products may require cold room storage. Refer to product specific technical data sheets for proper handling.*

SAFETY CONSIDERATIONS

Powder-in-air concentrations of greater than 0.02 - 0.05 ounces per cubic foot can be ignited by flame or strong electrical discharge. Powder concentrations below 0.02 oz./cu. ft. or above 0.05 oz./cu.ft. are too sparse or too dense to support flame of combustion. Properly engineered application equipment is designed to keep powder-in-air concentrations well below this range. All equipment should be inspected periodically for proper operation and electrical ground. Hangers, hooks, racking system, and conveyor should be cleaned to eliminate powder build-up. Eliminate all sources of ignition.

DISPOSAL

Alesta[®] powder coatings are classified as a Class III Non-hazardous Industrial Waste. Consult the Material Safety Data Sheet provided for the product you are using and verify the proper disposal procedure with local authorities. To eliminate powder dusting when discarding, sinter refuse powder with low heat (~200° F), or wet down. Do not place corrugated containers of refuse powder in oven because the paper may ignite.

Fundamentals

OF POWDER COATING OPTIMIZATION

STORAGE AND HANDLING

Alesta® powder coatings' charging properties are optimized when powder is free-flowing and moisture-free. Storage temperatures should be kept below 75° F and 50% relative humidity. If storage room temperature is lower than the application area, powder coatings, which are hygroscopic, should be acclimated in unopened containers prior to adding into the spray hopper. Unused powder should be stored in closed containers to prevent contamination. Powder should not be stored in hoppers for long periods of time. If moisture condensation occurs, fluidize powder to dry-out or replace moisture-laden powder with virgin powder.

Powder coatings are referred to as "particulates not otherwise classified" (PNOC). Properly fitted NIOSH-approved respirators or dust masks should be used by workers exposed to powder in their *respirable range in order to avoid dust inhalation. Powder spills should be swept or vacuumed-up and placed in refuse containers for proper disposal.

**(Respirable range – Powders up to 10 microns in size and up to eight (8) inches from the nasal area, can be inhaled into the respiratory system)*

GENERAL INFORMATION

SUBSTRATE

Steel, aluminum, and other electrically conductive substrates.

SUBSTRATE PREPARATION

Bare metal clean with no trace of oil, grease, rust, or moisture. Conversion coatings enhance adhesion and corrosion protection.

OPTIMUM APPLICATION INSTRUCTIONS

DuPont® electrostatic spray-grade* powder coatings should be applied with well maintained equipment where hoses, gun parts and hoppers are free of refuse powder. Contact points should be maintained to ensure metal-to-metal ground. Electrostatic voltage should be kept between 20-100 kV. Compressed air to the gun must be oil and moisture free. Spray booth and collection system should be maintained to provide sufficient air velocities. Safety procedures should be followed.

**(Fluid-bed dip formulations are available).*

RECLAIMING

Reclaim-to-virgin ratios should be carefully monitored to maintain spray consistency. Sieving powder before adding to hopper eliminates potential clumping or foreign matter.

Specialty

POWDER COATINGS

METALLIC – EFFECT POWDERS

Alesta® metallic-effect powder coatings are designed to provide application and physical performance properties equivalent to non-metallic formulations. Certain limitations do exist when using metallic-containing powders:

- **Reclaiming metallic powders** requires careful monitoring of reclaim-to-virgin ratios in order to maintain consistency.*
- **Metallic-effect pigments** (brass and copper) oxidize and darken upon prolonged or elevated temperature exposure. Avoid overbaking or curing at elevated temperatures.
- **Exterior exposure or high traffic** and handling can cause the soft metallic-effect pigments to erode and discolor. A clear topcoat is recommended for oxidizing atmospheres, harsh environments, or high-wear uses.
- **Independent laboratory testing** has proven that the minimum explosive concentration (MEC) of DuPont® metallic-effect powders is the same as non-metallic powders. The MEC range is 0.02-0.05 oz./cu.ft.

* *Bonded metallic products using DuPont's unique process reclaim more efficiently than non-bonded products.*

APPROVALS

UNDERWRITERS LABORATORIES	Alesta® powders in the standard chemistry product lines are U.L. recognized for steel enclosures of outdoor-use, air conditioning and electrical equipment (DTCOV2). This recognition pertains to fast or low cure powders in the complete gloss range (0-100 units at 60 degrees) where application is over either 3-stage iron phosphate or 5-stage zinc phosphate pretreatment. Excluded from this listing are aromatic-urethanes, textured coatings, and wrinkle finishes, among others. Check individual technical data sheet for specific approvals.
NSF® (POTABLE WATER 61)	Certain epoxy-grade formulations have been deemed acceptable for use on pipes, valves, tanks, and fittings which will house drinking water.
CATERPILLAR® HIGH PERFORMANCE	Certain formulations approved as primer coatings and topcoats for various equipment.
CNH®	Certain formulations approved for CNH® equipment.
JOHN DEERE® AGRICULTURAL	Certain formulations approved for farm equipment.
FOOD & DRUG ADMINISTRATION	Certain epoxy & hybrid powders meet the guidelines under Code of Regulations, Title 21, Section 175.300; Resinous and Polymeric Coatings.

Numerous specifications for airline equipment, computer hardware, automotive accessories, telephone and telegraph casings, and many entities have listed various DuPont® powder coatings as acceptable for use in their predetermined applications. Product information provided upon request.

Antique Powders

Alesta® antique powders are two-toned rolling textured coatings displaying metallic-effect colors in the peaks and solid colors in the valleys. The thick films of 3.0 – 6.0 mils are excellent to hide substrate imperfections, scratches, and chips. Certain chemicals and solvents attack the metallic pigments, but the base coat remains intact. The same limitations apply to antique coatings that are applicable to metallics. Refer to that section for in service and application recommendations.

Textured Powders

Alesta® textured powders are highly decorative finishes. The thick films of 2.5 – 4.0 mils are excellent to hide substrate defects. Close control of the film thickness is important for maintaining pattern consistency. DuPont® textures are available in various standard patterns.

MINI-TEXTURES a low gloss to semi-gloss sandpaper finish

RIVER TEXTURES a high gloss rolling finish

GRAIN TEXTURES a low gloss to semi-gloss more open finish

RIDGE TEXTURES a medium to high gloss pronounced finish

WRINKLE TEXTURES a low gloss to medium gloss crinkle finish

Alesta[®] Product Number System

DUPONT[®] STOCKS SEVERAL TYPES OF DECORATIVE POWDER COATINGS THE FIRST LETTER: BINDER TYPE

- | | |
|--|---|
| E = Epoxy | U = Aliphatic-Urethane (called Urethane) |
| R = Epoxy-Polyester Hybrid | P = TGIC-Polyester |
| A = Aromatic-Urethane | S = Siloxane or Silicone Polyester |
| G = Polyester, TMMGU Glycouril curative | H = Non-TGIC Polyester, HAA Curative |

	Epoxy	Hybrid	Aromatic Urethane	Aliphatic Urethane	TGIC Polyester	Polyester Wrinkle	NON-TGIC Polyester
Hardness	●●●●●	●●●●●	●●●●	●●●●	●●●●●	●●●●●	●●●●●
Flexibility	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Overbake Stability	●●	●●●●●	●●	●●●●●	●●●●●	●●●●	●●●●●
Exterior Durability	●	●	●●	●●●●●	●●●●●	●●●●●	●●●●●
Corrosion Protection	●●●●●	●●●●●	●●●●	●●●●	●●●●●	●●●●	●●●●
Chemical/Solvent Resistance	●●●●●	●●●●	●●●●	●●●●	●●●●●	●●●●	●●●●
Ease of Application	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●

This table shows the difference among binder types in the various performance characteristics

- Not Recommended ●● Fair ●●● Good ●●●● Very Good ●●●●● Excellent

THE SECOND LETTER: CURE RESPONSE

- F** = Fast cure. Generally 10 minutes @ 400° F is sufficient to cure 20-gauge metal and lighter. Low gloss products may require a slightly longer cure.
- L** = Low cure. Generally, 10 minutes @ 325° F is sufficient to cure EL and RL products on 20-gauge metal and lighter. For PL and UL products, 15-20 minutes @ 350° F is sufficient for cure.
- R** = Radiation rather than thermal cure system.
- S** = Slow cure. Generally 10-15 minutes @ 450°F or higher is sufficient to cure 20-gauge metal or lighter. Heavier substrates require more time and / or higher temperatures. Properties summarized are typical. Refer to individual product technical data sheet for specific cure information.

THE THIRD LETTER: COLOR

- | | | | |
|----------------------------------|----------------------------|---------------------------|-------------------------|
| A = Aluminum or Silver | G = Green | L = Ivory or Cream | S = Orange |
| B = Black | H = Gray | M = Maroon | T = Tan or Beige |
| C = Clear | J = Brown or Bronze | P = Pink or Purple | W = White |
| D = Gold, Brass or Copper | K = Blue | R = Red | Y = Yellow |

THE NUMBERS

The numbers are sequential to provide a unique identification for each product.

THE LAST LETTER: SURFACE TYPE

- | | | |
|---|------------------------------------|---|
| S = Smooth | G = Grain-Textured | A = Antique-Textured Metallic Vein |
| M = Metallic or Metallic - Effect Smooth | P = Protective (Functional) | W = Wrinkle |
| T = Fine-Textured | R = River or Ridge Texture | B = Bonded |
| H = Heat resistant | | |

THE LAST NUMBER: GLOSS AT 60°

- | | | | | |
|---------------------|---------------------|---------------------|---------------------|-------------------------|
| 0 = 0 to 9 | 2 = 20 to 29 | 4 = 40 to 49 | 6 = 60 to 69 | 8 = 80 to 89 |
| 1 = 10 to 19 | 3 = 30 to 39 | 5 = 50 to 59 | 7 = 70 to 79 | 9 = 90 and above |

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General Specifications

DuPont® introduced epoxy-polyester hybrid powders into the United States in the mid-70s. Hybrid powders provide an economical alternative to epoxies that are an excellent general purpose interior coating. Designed for decorative end service applications where exterior durability is not a requirement, hybrid chemistries will chalk and fade upon exposure to ultraviolet rays because of the epoxy component. However, the polyester component contributes to better resistance to yellowing upon overbake than typical epoxy chemistries.

Hybrid powders can be formulated to provide superior charging capabilities, first-pass transfer efficiency, and Faraday cage area penetration. Some DuPont® hybrids have food-contact utility (FDA), and have many formal recognitions from Underwriters Laboratories, Caterpillar®, and computer companies.

Typical Performance Properties

Physical performance results were measured using 24-gauge Bonderite 1000 Parolen® 60 steel panels with 1.5 - 2.0 mils of a high gloss formulation. Heavier ware require longer cure times or higher temperatures. Low gloss or textured finishes may require longer cure times. Physical properties typically decrease with decreasing gloss. Since results are formulation dependent, product specific testing is recommended.

Typical Film Thickness

1.5-6.0 mils

Cure Schedules

F-cure

20 minutes at 350° F
15 minutes at 375° F
10 minutes at 400° F
8 minutes at 425° F

L-cure

20 minutes at 275° F
15 minutes at 300° F
10 minutes at 325° F
8 minutes at 350° F

Overbake Stability

A hybrid powder will withstand twice the recommended cure time without discoloration.

Adhesion (ASTM D-3359, Method B)

Using pressure sensitive tape, no coating is lifted or removed between 1/8" cross-hatch scribes. (Rating = 5B).

Pencil Hardness (ASTM D-3363)

Using Eagle Turquoise pencil leads, surface hardness ranges from H to 2H.

Impact Resistance (Modified ASTM D-2794)

Using a falling weight impact tester, the film surface withstands up to 160 inch lbs. of direct and reverse impact.

Flexibility, Mandrel (Modified ASTM D-522)

The film surface withstands a 180° bend over a 1/8" diameter with no loss of adhesion or surface cracking.

Abrasion Resistance (Modified ASTM D-4060)

Coating weight loss after 1,000 cycles of Taber abramer equipped with CS-10 wheels loaded to 1 kg per wheel is approximately 40-60 mg.

Corrosion and Chemical Performance Properties

Salt Spray Resistance (ASTM B-117)

Scribed Bonderite 1000 steel panels in a 5% salt fog at 95° F and 100% relative humidity, exhibit no undercutting, rusting, or blistering of the film after 500 hours of exposure. After 1,000 hours, there is less than 1/16" undercutting. No effect is shown on Alodine 1200 aluminum panels.

Chemical and Solvent Resistance

After ambient temperature immersion in the listed solvent or reagent, the following results were reported for hybrid formulations. *Verification of resistance properties should be made for each chemical proposed for use with a specific coating, as results can vary greatly depending on formulation. Specific test results or additional testing can be acquired upon request.

SOLUTION	1 MONTH	3 MONTHS	6 MONTHS	12 MONTHS
0.1% Chlorine	No Effect	No Effect	No Effect	No Effect
Anti-Freeze (50% Ethylene Glycol)	No Effect	No Effect	No Effect	No Effect
87 Octane Unleaded Gasoline	No Effect	Dulls, Softens	Dulls, Softens	Dulls, Softens
15% Hydrochloric Acid	No Effect	No Effect	*No Effect Dulls Textures	*No Effect Discolors, Dulls Textures
40% Hydrochloric Acid	No Effect	*No Effect Discolors, Dulls Textures	*No Effect Discolors, Dulls Textures	*No Effect Discolors, Dulls Textures
15% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Test Terminated on Metallics	No Effect
40% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Test Terminated on Metallics	No Effect
Isopropyl Alcohol	No Effect	Dulls, Softens	Dulls, Softens	Dulls, Softens
Acetone	Dulls, Softens - 1 hour		Test Terminated - 1 hour	
Methyl Ethyl Ketone	Dulls, Softens - 1 hour		Test Terminated - 1 hour	
Brake Fluid D.O.T. Type 3	Dulls, Softens - 1 hour		Test Terminated - 1 week to 1 month	
Dow Oven Cleaner	Dulls, Swells		Test Terminated - 1 to 3 months	

*** Since hybrid formulations may contain ingredients which enhance or detract from chemical resistance, performance has been summarized in general terms for this chemistry. This chart is intended as a general guide for chemical resistance.**

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General Specifications

DuPont® introduced TGIC-polyester powders into the United States in the late 70s. TGIC-polyester powders are designed for decorative and protective end service applications where exterior durability is a requirement. Recent enhancements have provided premium durability TGIC-polyester grade powders that withstand South Florida weathering exposures beyond five years. Premium durability coatings are available upon request.

TGIC-polyester powders can be formulated to provide very good chemical and solvent resistance, Faraday cage penetration, out-gas resistance caused by substrate porosity, and scratch and mar resistance. Many Alestas® TGIC-polyesters have a variety of formal recognitions from Underwriters Laboratories, Caterpillar®, and automotive companies.

Typical Performance Properties

Physical performance results were measured using 24-gauge Bonderite 1000 Parcolene® 60 steel panels with 1.5 - 2.0 mils of a high gloss formulation. Heavier ware require longer cure times or higher temperatures. Low gloss or textured finishes may require longer cure times. Physical properties typically decrease with decreasing gloss. Since results are formulation dependent, product specific testing is recommended.

Typical Film Thickness

1.5-6.0 mils

Cure Schedules

F-cure

20 minutes at 350° F
15 minutes at 375° F
10 minutes at 400° F
8 minutes at 425° F

L-cure

20 minutes at 300° F
15 minutes at 350° F
7 minutes at 375° F
5 minutes at 400° F

Overbake Stability

TGIC-polyesters can withstand three times the recommended cure time without discoloration.

Dielectric Properties

Typical values equal 700 - 1,000 volts per mil for films up to 10 mils.

Reflectance

Unshaded white TGIC-polyester powders can provide reflectance values (Y-value) of 90 and greater.

Adhesion (ASTM D-3359, Method B)

Using pressure sensitive tape, no coating is lifted or removed between 1/8" cross-hatch scribes. (Rating = 5B).

Pencil Hardness (ASTM D-3363)

Using Eagle Turquoise pencil leads, surface hardness ranges from H to 2H.

Impact Resistance (Modified ASTM D-2794)

Using a falling weight impact tester, the film surface withstands up to 160 inch lbs. of direct and reverse impact.

Flexibility, Mandrel (Modified ASTM D-522)

The film surface withstands a 180° bend over a 1/8" diameter with no loss of adhesion or surface cracking.

Abrasion Resistance (Modified ASTM D-4060)

Coating weight loss after 1,000 cycles of Taber abraser equipped with CS-10 wheels loaded to 1 kg per wheel is approximately 40-60 mg.

Corrosion and Chemical Performance Properties

Salt Spray Resistance (ASTM B-117)

Scribed Bonderite 1000 steel panels in a 5% salt fog at 95° F and 100% relative humidity, exhibit no undercutting of the film after 500 hours exposure. No rusting or blistering occurs on panel face away from scribe. After 1,000 hours there is less than 1/16" undercutting. Alodine 1200 aluminum panels show no effect after 1,000 hours.

Chemical and Solvent Resistance

After ambient temperature immersion in the listed solvent or reagent, the following results were reported for TGIC-polyester formulations. *Verification of resistance properties should be made for each chemical proposed for use with a specific coating, as results can vary greatly depending on formulation. Specific test results or additional testing can be acquired upon request.

SOLUTION	1 MONTH	3 MONTHS	6 MONTHS	12 MONTHS
0.1% Chlorine	No Effect	No Effect	No Effect	No Effect
Anti-Freeze (50% Ethylene Glycol)	No Effect	No Effect	No Effect	No Effect
87 Octane Unleaded Gasoline	Dulls, Softens - 7 days	Dulls, Softens	Dulls, Softens	Dulls, Softens
15% Hydrochloric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	Discolors, Dulls	Discolors, Dulls
40% Hydrochloric Acid	Discolors, Dulls	Discolors, Dulls	Discolors, Dulls	Discolors, Dulls
15% Sulfuric Acid	No Effect	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
40% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
Isopropyl Alcohol	No Effect	Dulls, Crazes	Dulls, Softens	Dulls, Softens, Crazes
Brake Fluid D.O.T. Type 3	Dulls, Softens - 1 hour	Dulls, Softens	Dulls, Softens	Dulls, Softens
Acetone	Dulls, Softens	- 1 hour	Test Terminated - 1 hour	
Methyl Ethyl Ketone	Dulls, Softens	- 1 hour	Test Terminated - 1 hour	
Dow Oven Cleaner	Dulls, Discolors, Softens	- 7 days	Test Terminated - 1 month	

***DuPont® formulates TGIC-polyester products that exceed the above results. Since formulations may contain ingredients which enhance or detract from chemical resistance, performance has been summarized for this chemistry. This chart is intended as a general guide for chemical resistance.**

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General Specifications

Alesta® epoxy powders are designed for general purpose decorative and protective end applications where exterior durability is not a requirement. Epoxy chemistries will chalk and fade upon exposure to ultraviolet rays.

Epoxies can be formulated to provide superior chemical and solvent resistance, and scratch and mar resistance. Variable thin or thick films and fluid bed or electrostatic spray-grade materials are also available. Many Alesta® epoxies have food-contact utility (FDA), and have a variety of formal recognitions from Underwriters Laboratories, and automotive companies.

Typical Performance Properties

Physical performance results were measured using 24-gauge Bonderite 1000 Parcolene® 60 steel panels with 1.5 – 2.0 mils of a high gloss formulation. Heavier ware require longer cure times or higher temperatures. Low gloss or textured finishes may require longer cure times. Physical properties typically decrease with decreasing gloss. Since results are formulation dependent, product specific testing is recommended.

Typical Film Thickness

1.0-6.0 mils

Cure Schedules

F-cure

20 minutes at 350° F
15 minutes at 375° F
10 minutes at 400° F
8 minutes at 425° F

L-cure

20 minutes at 275° F
15 minutes at 300° F
10 minutes at 325° F
8 minutes at 350° F

Operating Temperature Range

-100° F to + 300° F. Slight discoloration will occur above 200° F under continuous operating conditions.

Dielectric Properties

Typical values equal 800 – 1,200 volts per mil for films up to 10 mils.

Adhesion (ASTM D-3359, Method B)

Using pressure sensitive tape, no coating is lifted or removed between 1/8" cross-hatch scribes. (Rating = 5B).

Pencil Hardness (ASTM D-3363)

Using Eagle Turquoise pencil leads, surface hardness ranges from 2H to 6H.

Impact Resistance (Modified ASTM D-2794)

Using a falling weight impact tester, the film surface withstands up to 160 inch lbs. of direct and reverse impact.

Flexibility, Mandrel (Modified ASTM D-522)

The film surface withstands a 180° bend over a 1/8" diameter with no loss of adhesion or surface cracking.

Abrasion Resistance (Modified ASTM D-4060)

Coating weight loss after 1,000 cycles of Taber abraser equipped with CS-10 wheels loaded to 1 kg per wheel is approximately 25-45 mg.

Corrosion and Chemical Performance Properties

Salt Spray Resistance (ASTM B-117)

Scribed Bonderite 1000 steel panels in a 5% salt fog at 95° F and 100% relative humidity, exhibit no undercutting of the film after 1,000 hours exposure.

Chemical and Solvent Resistance

After ambient temperature immersion in the listed solvent or reagent, the following results were reported for epoxy formulations. *Verification of resistance properties should be made for each chemical proposed for use with a specific coating, as results can vary greatly depending on formulation. Specific test results or additional testing can be acquired upon request.

SOLUTION	1 MONTH	3 MONTHS	6 MONTHS	12 MONTHS
0.1% Chlorine	No Effect	No Effect	No Effect	No Effect
Anti-Freeze (50% Ethylene Glycol)	No Effect	No Effect	No Effect	No Effect
87 Octane Unleaded Gasoline	No Effect	Dulls, Softens	Dulls, Softens	Dulls, Softens
15% Hydrochloric Acid	*No Effect Oxidizes Metallics	Dulls, Softens Oxidizes Metallics	Dulls, Discolors	Dulls, Discolors
40% Hydrochloric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	Discolors, Dulls
15% Sulfuric Acid	No Effect	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
40% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
Dow Oven Cleaner	Dulls	Dulls, Softens	Softens, Discolors	Softens, Discolors
Isopropyl Alcohol	No Effect	*No Effect. Dulls, Softens, Low Cure, Low Gloss	*No Effect. Dulls, Crazes, Low Cure, Low Gloss	*No Effect. Dulls, Softens, Low Cure, Low Gloss
Acetone	Dulls, Softens – 24 hours		Test Terminated – 7 days	
Methyl Ethyl Ketone	Dulls, Softens – 1 hours		Test Terminated – 1 to 30 days	
Brake Fluid D.O.T. Type 3	Dulls, Softens – 1 hour		Test Terminated – 1 to 6 weeks	

***DuPont® formulates many epoxy products that exceed the above results. Since formulations may contain ingredients which enhance or detract from chemical resistance, performance has been summarized for this chemistry. This chart is intended as a general guide for chemical resistance.**

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General Specifications

Alesta[®] aromatic-urethane powders offer a cost effective alternative to the aliphatic-urethanes. These powder coatings provide similar physical and performance properties of the aliphatics, but have reduced durability because of the aromatic crosslinking mechanism. Aromatic-urethane chemistries will chalk and fade at a rate of approximately twice that of more durable systems upon exposure to ultraviolet rays.

Aromatic-urethane powder coatings employ a blocked catalyst curing mechanism that requires the substrate to reach threshold temperature before curing starts. *A small amount of volatile is emitted during cure which is free from regulation. Coating thickness should be kept below 3 mils to avoid foam formation in cured films that can affect appearance and performance.

Typical Performance Properties

Physical performance results were measured using 24-gauge Bonderite 1000 Parcolene[®] 60 steel panels with 1.5 – 2.0 mils of a high gloss formulation. Heavier ware require longer cure times or higher temperatures. Low gloss or textured finishes may require longer cure times. Physical properties typically decrease with decreasing gloss. Since results are formulation dependent, product specific testing is recommended.

Typical Film Thickness

*1.5-3.0 mils

Cure Schedules

F-cure

20 minutes at 325° F

15 minutes at 350° F

10 minutes at 375° F

7 minutes at 400° F

Overbake Stability

Depending on color and gloss, slight discoloration may occur upon exposure to Infra Red wave lengths. In convection ovens, discoloration may occur in light or white pigmented products with lower gloss ranges. Therefore, cure times should be tightly controlled to ensure coating color and gloss consistency. Individual product testing is required.

Adhesion (ASTM D-3359, Method B)

Using pressure sensitive tape, no coating is lifted or removed between 1/8" cross-hatch scribes. (Rating = 5B).

Pencil Hardness (ASTM D-3363)

Using Eagle Turquoise pencil leads, surface hardness ranges from H to 2H.

Impact Resistance (Modified ASTM D-2794)

Using a falling weight impact tester, the film surface withstands up to 160 inch lbs. of direct and reverse impact.

Flexibility, Mandrel (Modified ASTM D-522)

The film surface withstands a 180° bend over a 1/8" diameter with no loss of adhesion or surface cracking.

Abrasion Resistance (Modified ASTM D-4060)

Coating weight loss after 1,000 cycles of Taber abramer equipped with CS-10 wheels loaded to 1 kg per wheel is approximately 40-60 mg.

Corrosion and Chemical Performance Properties

Salt Spray Resistance (ASTM B-117)

Scribed Bonderite 1000 steel panels in a 5% salt fog at 95° F and 100% relative humidity, exhibit no undercutting, rusting, or blistering of the film after 500 hours exposure. After 1,000 hours the panel exhibits less than 3/16" undercutting. Alodine 1200 aluminum panels show no effect after 1,000 hours.

Chemical and Solvent Resistance

After ambient temperature immersion in the listed solvent or reagent, the following results were reported for aromatic-urethane formulations. *Verification of resistance properties should be made for each chemical proposed for use with a specific coating, as results can vary greatly depending on formulation. Specific test results or additional testing can be acquired upon request.

SOLUTION	1 MONTH	3 MONTHS	6 MONTHS	12 MONTHS
0.1% Chlorine	No Effect	No Effect	No Effect	No Effect
Anti-Freeze (50% Ethylene Glycol)	No Effect	No Effect	No Effect	No Effect
15% Hydrochloric Acid	No Effect	Dulls, Softens	Dulls, Softens	Dulls, Softens, Discolors
40% Hydrochloric Acid	Discolors, Dulls	Discolors, Dulls	Discolors, Dulls	Discolors, Dulls
15% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
40% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
Isopropyl Alcohol	Dulls, Softens – 1 hour	Dulls, Softens, Crazes	Dulls, Softens, Crazes	Dulls, Softens, Crazes

Acetone	Peels, Wrinkles, Softens – Immediate	Test Terminated – 1 hour
Methyl Ethyl Ketone	Peels, Wrinkles, Softens – Immediate	Test Terminated – 1 hour
Brake Fluid D.O.T. Type 3	Dulls, Softens – 1 hour	Test Terminated – 7 days
Dow Oven Cleaner	Dulls, Softens, Discolors – 4 hours	Test Terminated – 3 to 8 months
87 Octane Unleaded Gasoline	Dulls, Softens – 1 hour	Test Terminated – 3 months

****Since aromatic-urethane formulations may contain ingredients which enhance or detract from chemical resistance, performance has been summarized for this chemistry. This chart is intended as a general guide for chemical resistance.***

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General Specifications

Alesta® aliphatic-urethane powders are designed for decorative end service applications where surface smoothness and/or exterior durability is a requirement. These coatings offer excellent flow characteristics, which provide the high surface Distinctness of Image (DOI) inherent to this chemistry. These flow characteristics are also responsible for the lack of edge coverage.

Aliphatic-urethanes can be formulated in premium durability powders, and graffiti-resistant products. Many aliphatic-urethanes have a variety of formal recognitions from Underwriters Laboratories, Caterpillar®, and automotive companies.

Aliphatic-urethanes usually employ a blocked catalyst curing mechanism that requires the substrate to reach threshold temperature before curing starts. *A small amount of volatile is emitted during cure which is free from regulation. Coating thickness should be kept below 3 mils to avoid foam formation in cured films that can affect appearance and performance.

Typical Performance Properties

Physical performance results were measured using 24-gauge Bonderite 1000 Parcolene® 60 steel panels with 1.5 - 2.0 mils of a high gloss formulation. Heavier ware require longer cure times or higher temperatures. Low gloss or textured finishes may require longer cure times. Physical properties typically decrease with decreasing gloss. Since results are formulation dependent, product specific testing is recommended.

Typical Film Thickness

*1.5-3.0 mils

Cure Schedules

F-cure

15 minutes at 375° F
10 minutes at 400° F
8 minutes at 425° F

L-cure

10 minutes at 350° F
9 minutes at 360° F
8 minutes at 400° F

Overbake Stability

Aliphatic-urethane powders can withstand twice the recommended cure time without discoloration.

Adhesion (ASTM D-3359, Method B)

Using pressure sensitive tape, no coating is lifted or removed between 1/8" cross-hatch scribes. (Rating=5B).

Pencil Hardness (ASTM D-3363)

Using Eagle Turquoise pencil leads, surface hardness ranges from H to 2H.

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ALIPHATIC - URETHANE TECHNICAL SUMMARY

Corrosion and Chemical Performance Properties

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Anti-Freeze (50% Ethylene Glycol)	No Effect	No Effect	No Effect	No Effect
15% Hydrochloric Acid	*No Effect Oxidizes Metallics	Dulls	Dulls, Softens	Blisters, Softens
40% Hydrochloric Acid	Discolors, Dulls	Discolors, Dulls	Discolors, Dulls	Discolors, Dulls
15% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
40% Sulfuric Acid	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics	*No Effect Oxidizes Metallics
Isopropyl Alcohol	Dulls, Softens	Dulls, Softens, Crazes	Dulls, Softens, Crazes	Dulls, Softens, Crazes
Acetone	Wrinkles, Softens	- 1 hour	Test Terminated - 1 hour	
Methyl Ethyl Ketone	Wrinkles, Softens	- 1 hour	Test Terminated - 1 hour	
Brake Fluid D.O.T. Type 3	Dulls, Softens	- 1 hour	Test Terminated - 7 days	
Dow Oven Cleaner	Dulls, Softens, Discolors	- 24 hours	Test Terminated - 3 to 8 months	
87 Octane Unleaded Gasoline	Dulls, Softens	- 1 hour	Test Terminated - 3 months	

***Since aliphatic-urethane formulations may contain ingredients which enhance or detract from chemical resistance, performance has been summarized for this chemistry. This chart is intended as a general guide for chemical resistance.**

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