Anderson
DEVELOPMENT COMPANY

ALMATEX®

ACRYLIC RESINS

PREMIUM

APPLICATIONS

- Automotive Coatings
- Clear Top Coats
- Automotive Primers
- Pigmented Coatings
- Architectural
- Outdoor Furniture
- Lawn & Garden
- Carbon Fiber Composites
- UV Curables
- Plumbing Fixtures
- Industrial
- Agricultural Machinery
- Aluminum & Other Metal Substrates
- Plastics & Other Heat Sensitive Substrates
- Wood & MDF Substrates

ACRYLIC RESINS

Keeping that shine on your automobile is important to you. **Our products help you maintain it.**

Our innovative acrylic resins are used extensively in powder coating applications in the automotive industry. Other markets include aluminum wheels, outdoor furniture, lawn and garden equipment, and various architectural uses.

These resins contain glycidyl functional groups which, when combined with polycarboxylic acid compounds as the curing agent, exhibit excellent properties for coating materials.

Powder coating made from Almatex® GMA acrylics is especially noted for weatherability, gloss, crystal clarity, chemical resistance, and smooth finish. The resins exhibit excellent overbake tolerance, good caking stability, excellent electrical insulation properties, and an outstanding performance in electrostatic spraying equipment.

Anderson Development Company has over 30 years of experience with GMA powder coatings and full capability to tailor-make Almatex® GMA acrylic resins. We can customize resins for your specific application.

Expanding our production capacity, Anderson Development Company now has innovative production technologies in US and Japan.

ALMATEX® GMA ACRYLIC RESIN TECHNOLOGY – FOR A SUSTAINABLE FUTURE!

At Anderson Development Company, the protection of our local and global communities are critical to the long term success of our customers and to the long term success of our company. Anderson Development Company follows the principles of Responsible Care® which aims to continually improve performance related to the environment, health, safety, and security with a focus on our stakeholders.

Anderson Development Company is committed to the UNEP goals, focusing on the Triple Bottom Line. Businesses must focus on the people and on the planet, not only profit, because we cannot be successful in a world that fails.
The use of Almatex® GMA acrylic resins in powder coating applications is well known to be **E**nvironmentally and **E**cologically friendly, **E**nergy and **E**conomy saving while providing **E**xcellent coating properties in finishing systems (known as E5). Almatex® GMA acrylic resins also can be used in bio-degradable plastics manufacturing.

Anderson Development Company is proud that Almatex® GMA acrylic resin promotes sustainability across the entire value chain.

Raw Materials	• Source materials through reputable, sustainable suppliers • Robust supply chain
Resin Manufacturing	• Facility is certified to ISO 9000/14000 and RC14000 • Almatex GMA acrylic resins are produced using highly automated process, producing near zero emissions or waste • Facility is operated in harmony with the local community • Produced to highest standard of cleanliness in industry for powder coating resin manufacturing • Production facilites in US and Japan
Coating & Plastic Formulation	• Ultra low VOCs, does not require afterburners, very low CO2 footprint • E5 GMA Acrylic Powder Coatings • Facilitates use of Bio-based hardeners • Reactive modifier to improve bioplastics/resins
Coating & Plastic Applications	• Ultra low VOCs, does not require after burners, very low CO2 footprint • Lower temperature cure reduces CO2 footprint and saves energy costs • Nearly 100% use of coating materials (Over-spray easily reused) • Low reject rates, robust process-does not drip or sag, high volume production rates • Easy clean-up and maintenance • Reduced marking potential, allowing faster production rates
Finished Product	• Robust products with longer lives • Tremendous outdoor weathering protection, shines longer with less cleaning • Superior corrosion protection

ADVANTAGES

- **Excellent Long term Weather Durability**
- **Superb Smoothness & Appearance**
- **Superb Chemical Resistance**
- **Crystal Clarity**
- **Hardness**
- **High to Low Gloss**

PERFORMANCE

DURABLE

FORMULATION PROCESS

PREMIX
ALMATEX® GMA acrylic resin is initially mixed with crosslinking agents, pigments, other additives and thoroughly dry blended.

MELT-Extrusion
The premix is then milled and blended with an extruder in a molten state. Properties of acrylic powder coating may vary depending on the compounding technique used.

PULVERIZING
After cooling the melt blended compound is crushed and passed through classification process for desirable particle size (typically 170-200 mesh).

APPLICATION
The powder is charged and sprayed with an electrostatic spray gun on a grounded substrate. Typical substrates include aluminum, steel, MDF, carbon fiber composites, plastic, and other heat sensitive substrates. GMA powder coatings are typically baked at 130 to 180°C for 10 to 40 minutes depending on the powder formulation.

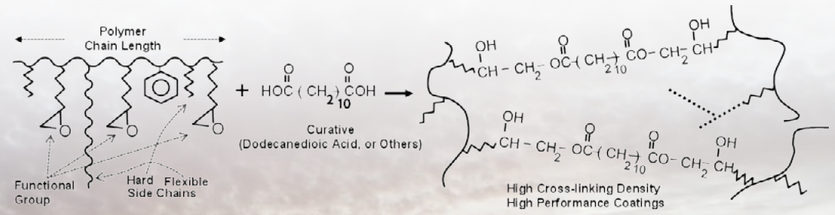
GMA POWDER COATINGS

Since GMA acrylic powder coating resins are epoxy functional, common curing mechanisms for epoxy resins will also function with GMA acrylic resins. The most widely used curative for GMA acrylic powder resins is 1, 12-dodecanedioic acid (DDDA) due to its combination of favorable melting point, cure rate, & viscosity profile. DDDA also provides cured coatings with excellent clarity, chemical resistance, and weatherability. Other polycarboxylic acids or anhydrides may be used as curatives or reactive additives to modify cure rate or coating properties.

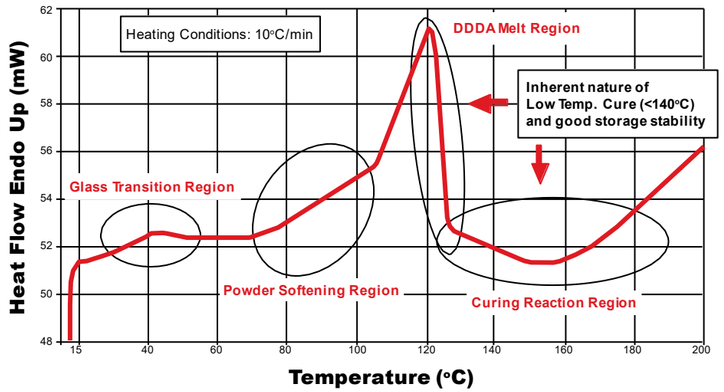
Many additives used in the powder coating industry may also be used in GMA acrylic powder formulations. These additives include: flow control agents (FCA), de-gassing agents, UVAs, and HALS. For clearcoat applications, non-silica dispersed FCA's or special solid FCA's are preferred. The selection of UVA/HALS can also effect the yellowing and degree of outdoor durability.

Through special resin design or coating formulation, GMA powder coatings can be:

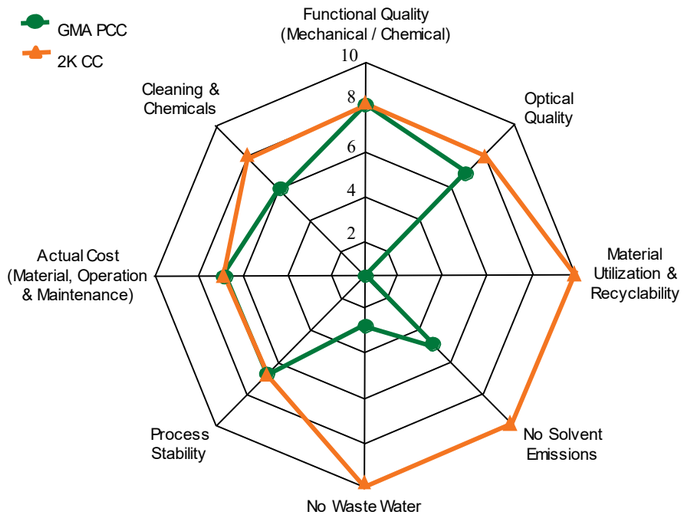
- Compatible with other powder coatings
- Low temperature cure
- High flexibility
- Highly pigmented
- High to low gloss finishes



TYPICAL DSC THERMOGRAM OF GMA POWDER COATING



GMA VS 2K CLEARCOAT



NOVEL

ANDERSON R&D SUPPORT CAPABILITIES

Global Support

Complete Powder Coating Laboratory

- Premix through Thermal/UV Oven Cure

Complete Powder Coating Testing Facility

- Thermal Analysis
- Weathering Testing
- Application Testing
- Other Property Analysis
- GPC/GC
- FTIR
- Mechanical Property Testers

Formulation Development

Problem Solving

Lab to Pilot Scale

DEPENDABLE

ANDERSON PRODUCTION CAPABILITIES

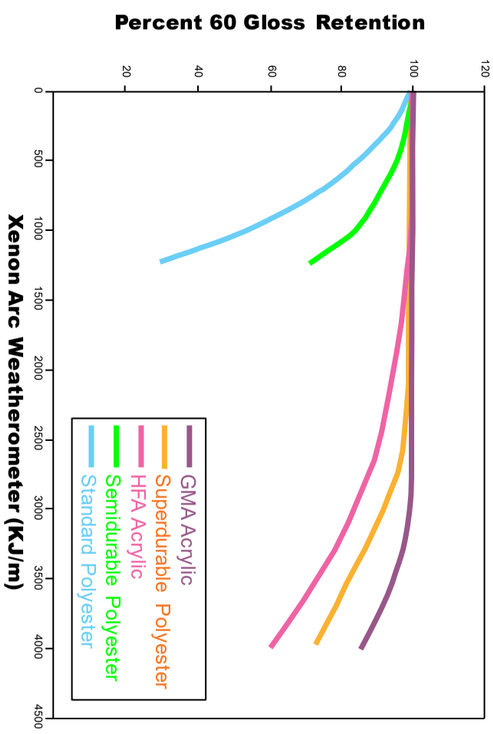
US and Japan Two Production Sites

Masterbatching

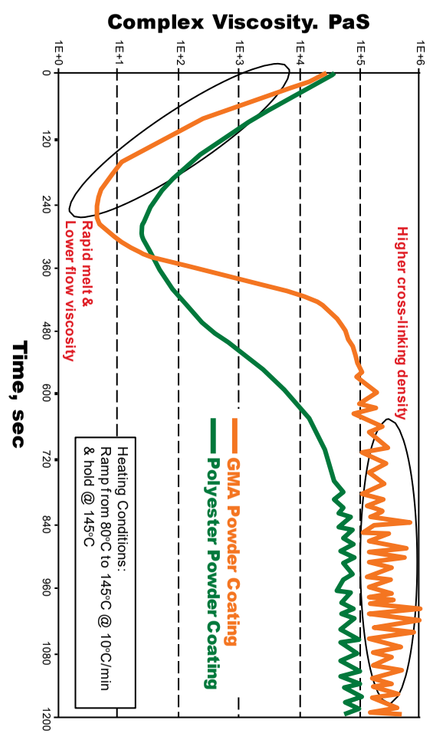
Various Packaging
- Bags
- Supersacks
- Drums

Toll Manufacturing
- ISO 9001 Certified
- ISO 14001 Certified
- RC 14001 Certified

GMA VS OTHER POWDER COATING CHEMISTRY IN WEATHERABILITY



COMPARISON OF POWDER MELTING-CURING PROFILE OF GMA & POLYESTER POWDER COATINGS



ALMATEX Acrylic Powder Resin Selection Guide

General Purpose

PD7610

- Higher Tg, Shorter gel-time → **PD6300** → Balanced Tg, MW Reactivity → **AP4404**
- Better Pigmentation, Adhesion, Higher Cross-linking density → **PD7690/PD5201** → Higher MW, Higher reactivity → **PD4219**
- Lower Cost → **PD9200**
- Hydroxy-GMA, Dual Functionality → **PD1700** → Better Flow, Cationic UV → **PD4409**
- Higher Hydrophobicity, Higher Corrosion Resistance → **PD4427**
- Higher Cross-linking density, Tg, Polyester/Epoxy Matting → **PD6400**
- Better Polyester Compatibility → **AP4411**
- Higher Cured Film Tg → **AP4444**

Contact us for custom Tailor-made products

Automotive Clear Top Coat (Low Melt Viscosity, Rapid Cure, High Cross-linking density)

PD3402 → Better Flow, Faster Cure, Higher Cross-linking Density → **PD4418** → Better Acid Etch Resist., Lower Temperature Cure → **PD4421**

Matting Resins

MT-2780 → Better Polyester Compatibility → **MT-4715**

Other Applications & Developmental Resins

- UV curable solid acrylic resins (**AP4410, AP4416**)
- Hydroxy functional acrylic resin (**HA2001**)
- High flexibility (**AP8500,** -COOH functional Aliphatic polyester)
- Chain Extender or Modifier for other polymers (such as PLA resins).
- Selected products can be made as masterbatch with flow agents or other additives.

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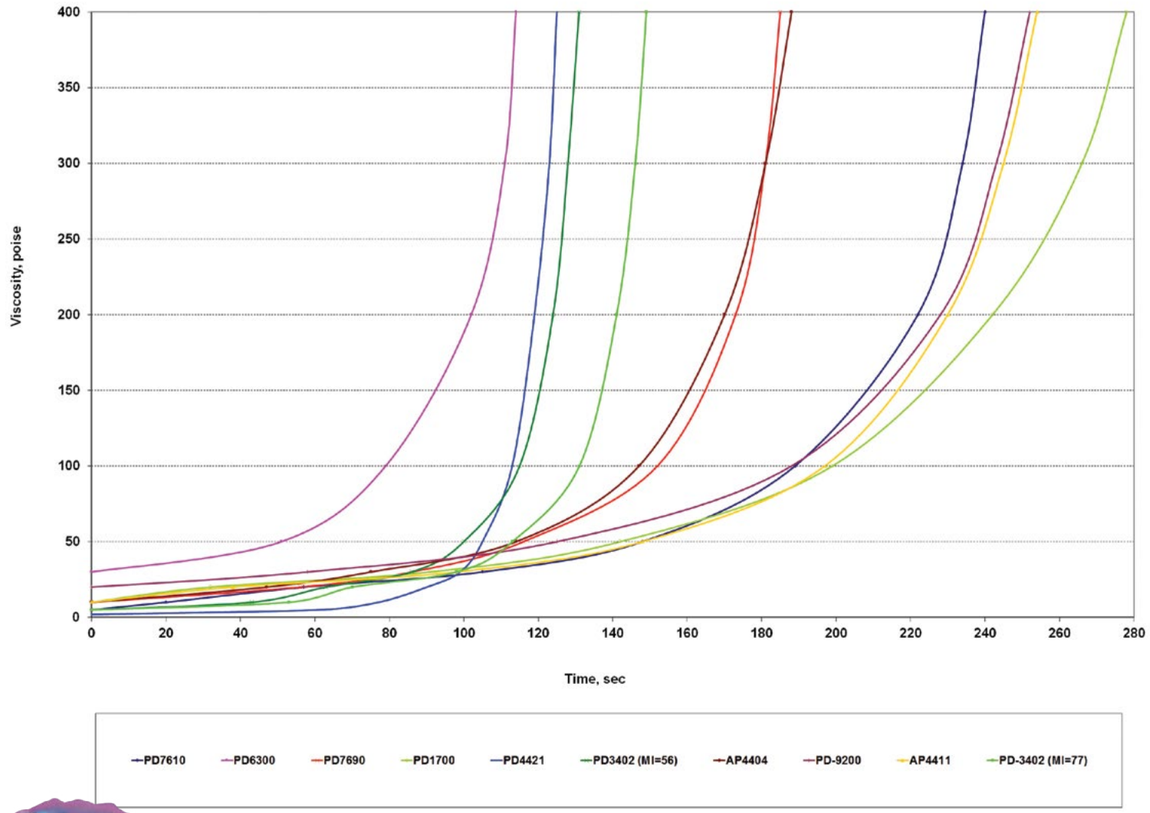
ALMATEX® RESIN PROPERTIES

ALMATEX® RESIN	EQUIVALENT WEIGHT (G/EQ.)	TG (°C)	MELT INDEX (G/10 MIN.) (@125°C)	MELT VISCOSITY (POISE) (@150°C)	RECOMMENDED APPLICATIONS
PD-7610 & PD-7610-J	510 - 560 EEW	45 - 50	46 - 54	200 - 250	General Purpose, Wheels, Auto Trims, Auto Primer-Surfaces.
PD-6300 & PD-6300-J	510 - 560 EEW	58 - 63	10 - 16	>500	Wheels, Auto Trims, auto Primer Surfaces, Blending Resin to PD 7610 or Others.
PD-7690	450 - 500 EEW	46 - 51	43 - 54	200 - 250	General Purpose, Pigmented, Wheels, Auto Trims.
PD-5201	460 - 480 EEW	45 - 50	45 - 60	200 - 250	General Purpose, Pigmented, Wheels, Auto Trims.
PD-4219	430 - 470 EEW	42 - 48	45 -60	180 - 260	General Purpose, Wheels, Auto Trims.
PD-1700	570 - 625 EEW; 950 - 1200 OH eqw	45 - 50	35 - 45	250 - 310	Additive to Various Powder Coating Systems, Epoxy & -OH Dual Functionality.
PD-4409	720 - 760 EEW; 950 - 1200 OH eqw	39 - 44	>110	75 - 125	GMA/Urethane Hybride Powder Coatings, Cationic UV Curable, Epoxy & -OH Dual Functionality.
PD-4440	395 - 445 EEW	64 - 69	10 - 20	>500	General Purpose, High Reactivity, Chain Extender for Other -COOH Containing Polymers.
PD-3402	360 - 400 EEW	44 - 50	50 - 70	180 - 250	Automotive Clear Top Coat, Wheels, Fast Cure.
PD-4418	300 - 330 EEW	41 - 46	>110	85 - 125	Automotive Clear Top Coat, Wheels, Fast Cure.
PD-4421	300 - 330 EEW	40 - 45	>110	85 - 125	Automotive Clear Top Coat, Wheels, Lower Temperature/Fast Cure, Good Acid Etch Resistance.
PD-9200	650 - 690 EEW	44 - 50	45 - 60	180 - 280	General Purpose, Lower Cost.
PD-4427	515 - 555 EEW	50 - 55	20 - 30	300 - 470	General Purpose, Wheel, Better Corrosion Resistance.
PD-6400	375 - 435 EEW	46 - 51	30 - 43	210 - 300	General Purpose, Higher Reactivity, Matting.
MT-2780	760 - 810 EEW	55 - 60	6 - 10	>500	Polyester Matting.
MT-4715	695 - 735 EEW	53 - 59	5.5 - 10.5	>500	Polyester Matting, Improved Compatibility.
AP-4411	490 - 540 EEW	40 - 46	45 - 60	180 - 250	Polyester Compatibility.
AP-4444	400 - 440 EEW	49 - 55	38 - 48	200 - 300	General Purpose, Wheels, Auto Trims, Higher Coating Tg.
AP-4410	730 - 770 Double Bond eqw	40 - 45	90 - 110	90 - 140	Free Radical UV Curable Powder Coatings.
AP-4416	740 - 780 EEW	41 - 46	>110	80 - 120	Cationic UV Curable Powder Coatings.
HA-2001	652 - 748 OH eqw	45 - 52	40 - 100	100 - 250	Hydroxy Functional Acrylic; Urethane-Acrylic Powder Coatings.
AP-8500	970 - 1040 COOH eqw	60 - 100 M.P.	NA	9 - 11 @125°C	Crystalline aliphatic polyester; DDDA Replacement for High Flexibility.

Note: Data shown in this table is for resin selection guideline not for QC specification.

SELECT CURE-CURVE OF ALMATEX® GMA RESINS



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Corporate Mission: Anderson Development Company will be a global supplier of innovative specialty chemical products, striving for continual improvement in all of our operations. It is our goal to be personal, efficient, and responsive to our customers and employees. We will provide a team-oriented atmosphere while allowing for individual diversity among our employees.

Mitsui Chemicals
Group

American Chemistry Council

RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

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