

ADDITIVES AND HARDENERS FOR POWDER COATINGS



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Facts & Figures

- Global company with over €2.1 billion in sales
- Broad technology portfolio: liquid coating resins, energy curable resins, powder coating resins, crosslinkers and additives, composites and construction materials
- Approximately 4000 employees
- Customers in more than 100 countries
- 33 manufacturing facilities
- 23 research and technology centers
- 5 ventures
- Extensive range of solutions for key coating segments: automotive, industrial, packaging coating and inks, protective, industrial plastics and specialty architectural

With manufacturing, R&D and technical facilities located throughout Europe, North America, Asia Pacific and Latin America, allnex offers global and reliable supply of resins and additives combined with local, responsive customer support.

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About Additives and Hardeners

allnex, as the market leader in the powder coatings world, offers a range of additives and special products together with the broad portfolio of resins for powder coating. Those products help our customers to solve coating problems and to reach special finishing effects.

This portfolio includes:

- Flow Promoter Masterbatches & Silica Dispersed Flow Promoters
- Acrylic Matting Agents/Masterbatch Wrinkle Catalyst
- Masterbatch Catalyst/Masterbatch Tribo
- Poly-anhydrides
- Isocyanate PU Hardeners

The above range of products can serve all the major powder market segments:

- Architectural
- Automotive & Transportation
- General Metal Industry
- Domestic Appliances
- Furniture

ADDITOL®, MODAFLOW®, SYNTHACRYL®, BECKOPOX® are the tradenames for this range of additives and special products.



Flow Promoter Masterbatch & Silica Dispersed Flow Promoter

Flow promoter masterbatches and silica dispersed flow promoters may be defined as surface tension modifiers, as this is the main function they help to achieve. The term “flow promoter additives” is widely used for these products which primarily prevent craters in powder coatings, reduce the orange peel texture and improves DOI. allnex carries both Silica Dispersed Flow Promoters (MODAFLOW®) and Polyester Carrier Flow Promoters (ADDITOL®) depending on the needs of the consumer.

Tables on the right indicate the best powder systems and performance requirements for both the MODAFLOW Powder III and MODAFLOW Powder 6000.

Products include:

Flow Promoter Masterbatch:
ADDITOL P 824, ADDITOL P 890, ADDITOL P 891,
ADDITOL P 896

Silica Dispersed Flow Promoter:
MODAFLOW Powder III, MODAFLOW Powder 6000

	MODAFLOW Powder III	MODAFLOW Powder 6000
Epoxy	●	◐
Epoxy-Acrylic Hybrid	◐	◐
Epoxy-Polyester Hybrid	●	●
Polyester TGIC	◐	●
Polyester Glycidylester	◐	◐
Polyester Hydroxyl Alkyl Amide	◐	●
Acrylic Urethane	●	◐
Polyester Urethane	◐	●
Glycoluril	◐	●
Melamine	●	●
Glycidyl Methacrylate	◐	◐
FDA Applications	●	◐

	MODAFLOW Powder III	MODAFLOW Powder 6000
Gloss	◐	●
DOI, reduce orange peel	◐	◐
Levelling	◐	●
Crater Control	●	◐
Pinhole Elimination	●	◐
De-air/Defoaming	●	◐
Surface Wetting	◐	◐
Slip & Mar Resistance	◐	◐
Adhesion-substrate/Intercoat	◐	●
Recoatability	◐	●
Robust/Cross-Compatibility	◐	●
Special Textures	◐	◐
Clarity	◐	◐
FDA	●	◐

- ◐ Recommended
- Highly recommended

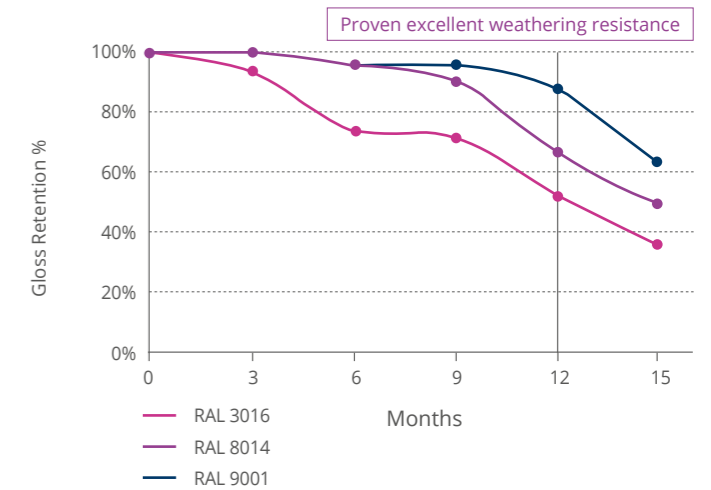
Isocyanate PU (Polyurethane) Hardener

An important family of hardeners that allnex provides are the isocyanates. Isocyanate hardeners react with hydroxylated polyester resins to form an integral bond in the binding system of polyurethane powder coatings. The ADDITOL® P932 chart indicates its excellent weathering resistance over time.

Products include:

ADDITOL P 932, ADDITOL P 965

Florida results of different RAL formulations with CRYLCOAT 2839-0/ADDITOL P 932



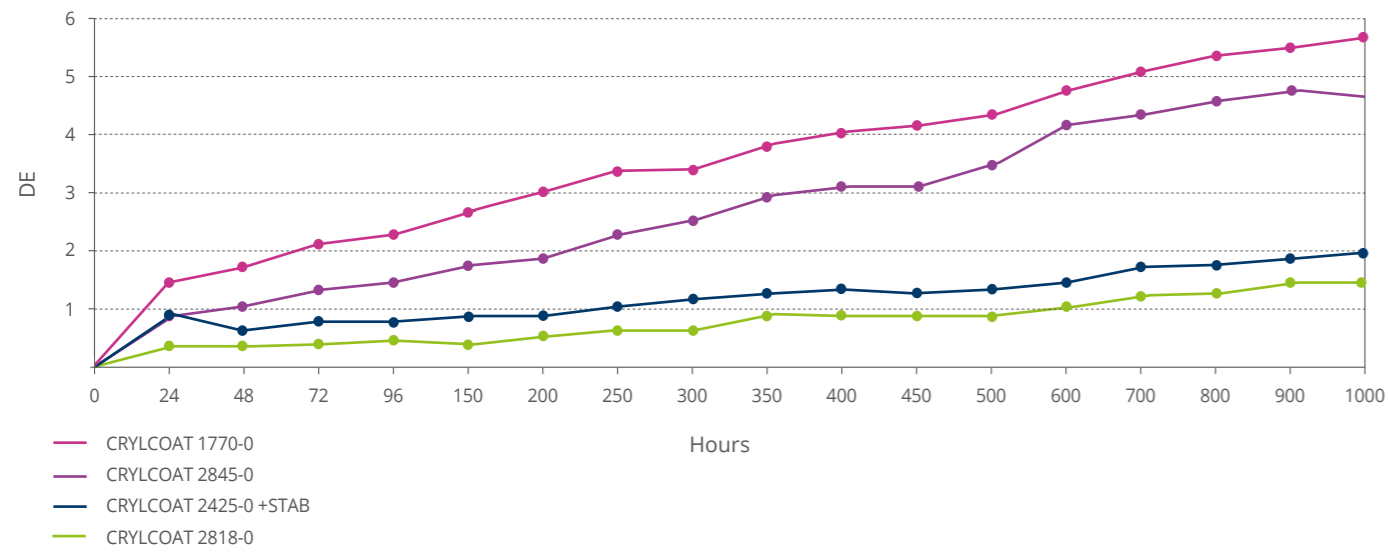
Poly-anhydride Hardener

The allnex line of poly-anhydride hardeners has been created with the consumer in mind, offering a superior alternative system for clear automotive and for metal packaging. The line contains both the ADDITOL® P 791 (for use with solid acrylic resins containing glycidyl groups) and the BECKOPOX® 694 (for use with OH-functional polyesters or with epoxy resins). Poly-anhydrides are reacting with glycidyl functional groups and/or with hydroxyl functional groups. BECKOPOX EH 694-based coatings offer outstanding thermal stability in comparison with most common

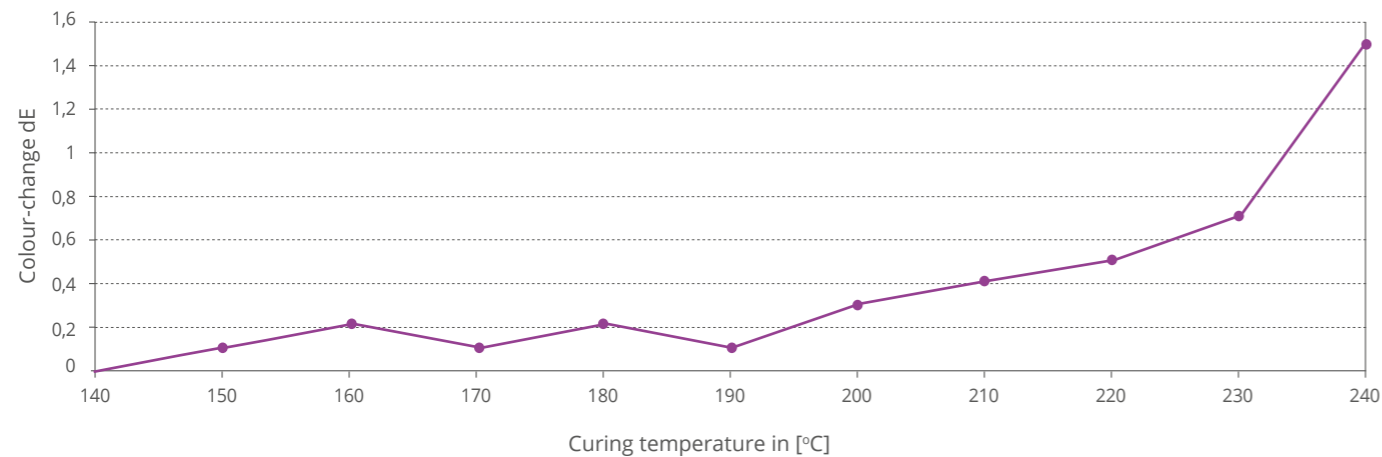
powder binders. ADDITOL P 791-based coatings achieve outstanding flow in clear formulations. As you can see in the graph below, CRYLCOAT 2818-0 (which includes BECKOPOX EH 694) remains very stable over a long period of time without the need of an additional stabilizer. In the bottom graph, BECKOPOX EH 694 displays very low yellowing until the temperature reaches 240C.

Products include
ADDITOL P 791, BECKOPOX EH 694

Thermal stability test at 140°C of CRYLCOAT 2818-0 which includes BECKOPOX EH 694 (other systems without EH 694)



Cycle for DE: 20 Min at 140 °C: 20 minutes at each temperature for CRYLCOAT 2818-0 with BECKOPOX EH 694 system



Masterbatch Catalyst & Masterbatch Tribo

Our Masterbatch Tribo and Masterbatch Catalyst products have been specifically created by allnex specialists to help properly formulate powder coatings to achieve the required reactivity and Tribo chargeability when desired, allowing for superior coating penetration on complex shapes for indoor or outdoor items.

Products Include:
Masterbatch Catalyst: ADDITOL® P 963, ADDITOL P 964
ADDITOL P 966
Masterbatch Tribo: ADDITOL P 950

ADDITOL P 964 is a catalyst masterbatch designed for use in hybrid, TGIC or ARALDITE® PT-910 systems. ADDITOL P 964 contains 5% of active substance and it is designed for both indoor and outdoor use.

The table below shows how ADDITOL P964 improves coating properties at lower curing schedules.

Property	CRYLCOAT® 1627-0 w/o P964	CRYLCOAT 1627-0 + 5% P964	CRYLCOAT 1627-0 + 10% P964
Gel Time 180°C (s)	250	141	88
PCI (80µ)	6-7	4	2-3
Inclined plate flow test (mm)	50	33	24
Curing condition	150°C x 12'	150°C x 12'	150°C x 12'
Layer/Thickness (µm)	-	63-81	66-90
Gloss (20° - 60°)	-	94/100	92/100
Impact fresh (i.p.)	-	160-160	160-160
Impact 24 hours (i.p.)	-	160-20	160-160
Curing condition	140°C x 12'	140°C x 12'	140°C x 12'
Layer/Thickness (µm)	-	64-92	60-95
Gloss (20° - 60°)	-	95/100	93/100
Impact fresh (i.p.)	-	0-0	160-160
Impact 24 hours (i.p.)	-	-	160-140
Curing condition	130°C x 17'	130°C x 17'	130°C x 17'
Layer/Thickness (µm)	-	-	62-82
Gloss (20° - 60°)	-	-	90-100
Impact fresh (i.p.)	-	-	20-20
Impact 24 hours (i.p.)	-	-	20-0

ADDITOL P 950 is a tribo-active masterbatch designed for use in hybrid, HAA, TGIC, poly-urethane, PT910 systems. ADDITOL P 950 contains 5% active substance that greatly enhances the charging ability of powder coatings sprayed with a tribo powder spray gun. ADDITOL P 950 is easily handled, greatly improves the dispersion of the additive in powder coatings and is designed for indoor or outdoor use.

Kleber Tribo test (60 g of powder)
CRYLCOAT® 1630-0/EP 3003 with ADDITOL P 950

	I (mA) (Charging Current)	Q (mC) (Charge transported)	T (sec)
P 950 1.8%	1.1	22	18.4
P 950 6.5 %	2.0	37	18.6



Masterbatch Wrinkle & Acrylic Matting Additive

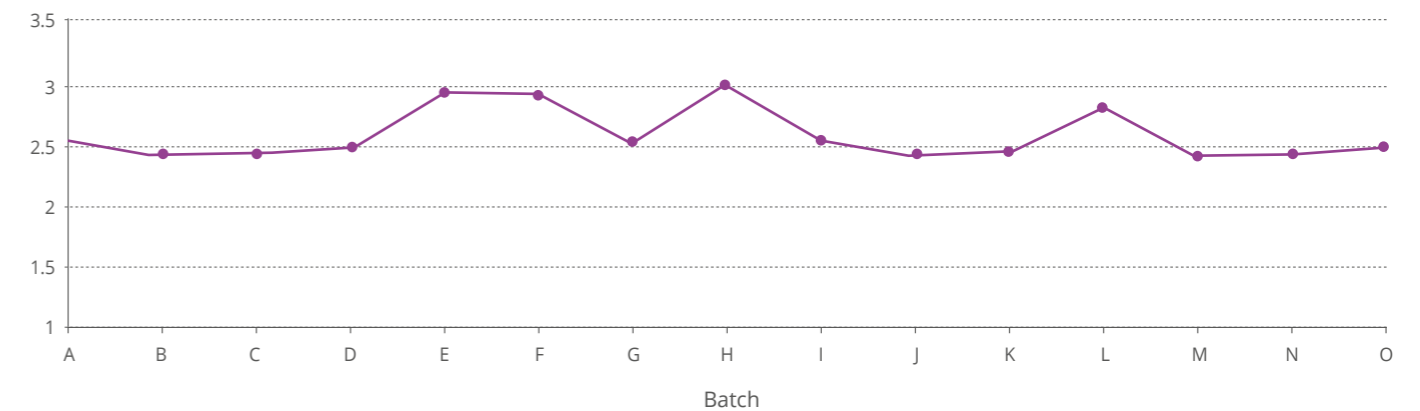
In the wide range of products allnex offers, the ability to reduce gloss can be achieved with our acrylic matting agents. Our acrylic matting agents also offer a dead matte coating with variety in flexibility, depending on your needs. Similarly, the desired effect of wrinkling can be achieved with our wrinkle masterbatch products. By using the special catalyst ADDITOL® P 920, our product CRYLCOAT® 2920-0 can create the desired wrinkle effect.

Products include

Masterbatch Wrinkle: ADDITOL P 920,
 Acrylic Matting Agent: SYNTHACRYL 700,
 SYNTHACRYL 710

White formulation	%
SYNTHACRYL 700	19.5
CRYLCOAT 2441-2	50.2
Benzoin	0.3
MODAFLOW® P 6000	1.0
TiO2	29.0
	100

Matte Consistency of multiple batches of White formulation based on SYNTHACRYL 700



Additives for Powder Coating Formulations

Product name	AV, mg KOH/g	Viscosity, mPa.s	Characteristics
Catalyst Masterbatches			
ADDITOL® P 964	33	3200	A 5% active catalyst masterbatch for carboxylic acid/epoxy reaction.
ADDITOL P 966	35	1900	A 5% active catalyst masterbatch for carboxylic acid/epoxy reaction. Suitable for superdurable formulations.
Flow Masterbatches			
ADDITOL P 824	45 OH	1400	Flow promoter masterbatch with 15% active substance. 3-5% on total formulation weight for pigmented powders. Excellent gloss and flow.
ADDITOL P 891	35	2300	Flow-aid masterbatch for clear powder coatings with 5% active substance. 7-10% on total formulation weight. No haze.
ADDITOL P 896	45 OH	1700	Flow promoter masterbatch with 15% active substance. 3-5% on total formulation weight for pigmented powders
ADDITOL P 890	50 OH	1500	Flow-aid masterbatch for clear powder coatings. 10 % active substance in an outdoor resistant hydroxylated polyester matrix. 7-8% on total formulation weight. No haze.
Tribo Masterbatch			
ADDITOL P 950	28 OH	7500	Tribo masterbatch with 5% active substance.
Additol for Wrinkle Masterbatch			
ADDITOL P 920	44	8500	Catalyst masterbatch for wrinkle finish with CRYLCOAT® 2920-0.

OH indicates value is hydroxy value'

Product name	Volatile loss, % w/w	Active Substance %	Characteristics
Silica Dispersed Flow Promoters			
MODAFLOW® P III	4 max	65 min	0,75-1,5 phr in pigmented powder coatings. It improves flow and leveling and reduces the surface defects.
MODAFLOW P 6000	4 max	65 min	0,75-1,5 phr in pigmented powder coatings. It improves flow and leveling and enlarges the cross-compatibility between powder formulations.

Product name	Tg, °C	EEW, g/eq	Viscosity, mPa.s	Characteristics
Acrylic Matting Additive				
SYNTHACRYL 700	80	770	40000	Acrylic matting hardener for the production of dull matte coatings with CRYLCOAT® 2441-2.
SYNTHACRYL 710	54	610	24000	Acrylic matting hardener for the production of dull matte coatings with CRYLCOAT 2441-2. Improved flexibility.

Product name	Tm, °C	AV, mg KOH/g	Viscosity, mPa.s	Characteristics
Polyanhydride Hardeners				
ADDITOL® P 791	85	315	-	Aliphatic polyanhydride crosslinker for use with GMA-acrylic resins. The resin is not available in large quantities.
BECKOPOX™ EH 694	55	275	-	Anhydride hardener for OH polyester or acrylic or epoxy resins. Outstanding chemical and overbake resistance.

Product name	NCO %	Tg, °C	Characteristics
Isocyanate Polyurethane Hardeners			
ADDITOL P 932	9-10	47	Aliphatic urethane pre-polymer crosslinker for outdoor applications.
ADDITOL P 965	16-17	51	Aromatic urethane adduct crosslinker for indoor applications.

