PHENOLIC CROSSLINKERS

Product Guide - Phenodur® Resins - Worldwide

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The Coating Resins Company

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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
- 32 manufacturing facilities
- 23 research and technology centers
- 5 joint 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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Introduction

Phenolic Resins
allnex has a long history as a phenolic coating resins producer. Today, phenolic resins are used in a wide variety of applications, including many types of high-performance coatings such as interior and exterior can coatings. To address the needs of our customers, we have developed a variety of phenolic resins recommended for BPA-NI applications. We have also addressed the ongoing reclassification of formaldehyde in Europe by reducing the free formaldehyde value of certain grades. As a result, we can offer a selection of phenolic resins with a free formaldehyde value of < 0.1% and have developed modifications of commercialized grades with a reduced free formaldehyde level called "LF" [lower free formaldehyde]. These products are produced mainly at our site in Europe, but a selected range is now made in the US as well. Grades with lower free monomer levels (< 0.1%) in addition to lower free formaldehyde (< 0.1%) are also available providing a safer workplace.

allnex's Goals in Research and Development
allnex focuses on gaining a fundamental understanding of the technical challenges encountered by our customers as they work towards improving their formulations. allnex also focuses on offering solutions quickly and cost-effectively. Equally important is our commitment to developing new products that fulfill longstanding needs of the industries we serve. Our technical specialists routinely visit customer locations, worldwide, to assist them in resolving problems including worker safety and accelerating the development of better products. allnex's research and development efforts are directed towards improvements that impact our 5 sustainability pillars

- We explore options to limit the consumption of resources, keep them in use as long as possible, and finally recover and recycle them at the end of service life.
- We design our product and manufacturing process to achieve the highest efficiency in energy utilization across the product lifecycle.
- We aim to minimize the use of finite resources and reduce the impact on climate change by looking at renewable alternatives for raw materials and energy we use.
- We are committed to making the substitution of potentially harmful chemicals with safer options one of our top priorities.
- We focus on reducing emissions of Volatile Organic Solvents across the product lifecycle to protect people and the environment.

True Customer Commitment
With our extensive portfolio of liquid resin & additive, radiation cured and powder coating resin & additive, and crosslinker technologies, we are ideally positioned to help customers find solutions to all of their coating challenges. We are dedicated to delivering value through the development of innovative, market-leading, high quality products that offer enhanced performance, increased ease-of-use, environmental compliance and reduced cost.

Phenolic Resin Grades

ALNOVOL PN 650
Non-functionalized /non-reactive phenolic Novolac type. Intended to be used as flexibilizer for phenolic resole grades to increase total phenolic amount in recipe in order to improve retort resistance. Helps to reduce formaldehyde emission. Extremely low free formaldehyde value as form of delivery.

PHENODUR® PR 217
Medium reactive, rather dark color, good flexibility (deep drawing ability) and acid retort resistance.

PHENODUR EP 560
Straight phenol based type of very high chemical resistance and limited flexibility. For can coatings including BADGE- and BPA-NI formulas and interior drum linings. Higher free phenol level vs. PHENODUR PR 371.

PHENODUR PR 285
Very reactive, cures from 160°C onwards. Catalysts are not recommended. For "coil for can" systems and BADGE- and BPA-NI applications.

PHENODUR PR 307, PR 308, PR 309
Tinting/coloring resins to adjust gold shade of the cured coating films. Very dark as form of delivery. PR 309 is the newest coloring agent development of Allnex and is not based on natural resin, extracted of pinewood stumps.

PHENODUR PR 385:
Straight phenol based type of very high chemical resistance and limited flexibility. For can coatings including BADGE- and BPA-NI formulas and interior drum linings. Very low free formaldehyde and phenol content.

PHENODUR PR 371/70B and 70B LF
Straight phenol based type of very high chemical resistance and limited flexibility. For can coatings including BADGE- and BPA-NI formulas and interior drum linings. Low free formaldehyde version available.

PHENODUR PR 401, PHENODUR PR 411
Straight Bisphenol A based products. Very reactive, very light color (silver lacquer); somewhat less flexible, good sterilization resistance. PHENODUR PR 411 has lower content of free formaldehyde and monomers vs. PHENODUR PR 401.

PHENODUR PR 515/60LG and 60B/X
Partially Bisphenol A based. Very reactive, light color, somewhat less flexible, good sterilization resistance. PHENODUR PR 515 is slightly more flexible than PHENODUR PR 401and PHENODUR PR 411.

PHENODUR PR 516/60B and 60B LF
BISPHENOL A free alternative to PHENODUR PR 515; recommended for BADGE- and BPA-NI usage. Low free formaldehyde version available.

PHENODUR PR 517
Good flexibility and high sulphur resistance with EPOXY- and PE resins. Low free formaldehyde of < 0,5%.

PHENODUR PR 520
Type PHENODUR PR 516, higher solid (less VOC) and less migration, curing speed slightly lower vs. original type PHENODUR PR 516. Intended to be used for BADGE- and BPA-NI application.

PHENODUR PR 521
Higher reactive version of PHENODUR PR 516, for BADGE- and BPA-NI usage.

PHENODUR PR 566
Good flexibility and sulphur resistance, light color, Medium reactivity.

PHENODUR PR 612
High solid, low viscosity, medium reactive, giving yellow/greenish color shade; very flexible and good retort resistance. Catalyst is necessary (CYCAT® XK 406 N).

PHENODUR PR 616
Higher reactive version of PHENODUR PR 612 with enhanced curing speed. Addition of catalyst (CYCAT® XK 406 N) is recommended. For "coil for can" systems and BADGE- and BPA-NI applications.

PHENODUR PR 722
Very good overall properties, very good sulphur staining resistance; medium reactivity, excellent flexibility, rather light in color. Catalyst CYCAT XK 406 N is necessary.

PHENODUR PR 787 50MP
Higher reactive version of VPR 1785 by maintaining excellent flexibility. To be combined either with less epoxy than usual or with polyvinyl butyral/ polyesters to formulate BADGE- and BPA-NI systems. Eco-friendly product, free formaldehyde and free monomers < 0.1%.

PHENODUR PR 825
Very light color, excellent flexibility and good sulphur resistance, medium reactivity, for BADGE- and BPA-NI usage, "coil for can" cycle and foils.

PHENODUR PR 827
Light color, excellent flexibility and good sulphur resistance, medium reactivity, for BADGE- and BPA-NI usage, "coil for can" cycle and foils.

PHENODUR PR 830
Light color, excellent flexibility and good sulphur resistance, medium reactivity, for BADGE- and BPA-NI usage, "coil for can" cycle and foils. Alternative to PHENODUR PR 827 in different solvent.

PHENODUR PR 897, PHENODUR PR 898
Excellent flexibility and retort resistance; low reactivity. The cured film is slighty golden in color. Catalyst CYCAT XK 406 N is necessary.

PHENODUR PR 899
Excellent chemical resistance, medium flexibility, golden color shade, for BADGE- and BPA-NI lacquers.

PHENODUR VPR 1785/50MP and 65B
Very high flexibility. To be combined either with less epoxy than usual or with polyvinyl butyral/polyesters to formulate BADGE- and BPA-NI systems. Eco-friendly products, free formaldehyde and free monomers < 0.1%.

PHENODUR VPM 1150
Not a phenolic resin, TMA hardener (crosslinker) for high molecular weight epoxide resins to formulate clear and white interior/exterior coatings. Formaldehyde-free product.

PHENODUR VPW 1942
Waterborne phenol/epoxide pre-condensate; A unique combination of high molecular weight, high solids, extremely low VOC and very small particle size; good reactivity, light golden in color, for "coil for can" (coilcoating); very good adhesion to aluminum and other non-ferrous metals; excellent corrosion resistance at low film thickness; medium retort resistance and sulphur staining resistance; good wetting and flow. For interior drum linings and heat curing anti-corrosion primer application.

PHENODUR VPW 1946
Waterborne type PHENODUR VPW 1942 resin with higher curing speed and improved chemical resistance. For interior drum linings and heat curing anti-corrosion primer application.

PHENODUR VPW 1947
real self-crosslinking grade, can be used either as sole binder, or in combination with backbone binders, good adhesion on various metal substrates, excellent chemical/acid resistance, high hardness & heat resistance.

Phenolic Resins for Can Coatings

		Compatibility			Typical stoving conditions					Resistance		Applications								HazCom
Products	NV (solid content/ solvent)	With epoxy resins	With PVB	Color (cured film)	Time [min]	Temperature (°C)	Catalyst CYCAT® XK 406N	Wedge bend	Erichsen cup no. 2	Lactic acid 2% (1h-129°C)	Cysteine test (90min-121°C)	Coil for can	Can	Tubes	Drums	Metal foils	Silver lacquer	Bis-A/ BADGE NI	Water borne	Free formaldehyde < 0.1%
ALNOVOL® PN 650	60 B	Yes	Yes	Less dark	10-12	200	Yes	Flexibilizer	Flexibilizer	Flexibilizer	Flexibilizer	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes
PHENODUR EP 560	71	Yes	Yes	Less dark	10-12	180-200	Yes	Good	Good	Very good	Good	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes
PHENODUR PR 217	65 B	Yes	No	Dark	10-12	200	Yes	Very good	Good	Good	Poor	No	Yes	Yes	No	No	No	No	No	No
PHENODUR PR 285	55 IBB	Yes	Yes	Dark	10-12	190	No	Very good	Good	Good	Good	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
PHENODUR PR 371	70 B / 70 B LF	Yes	Yes	Less dark	10-12	180-200	Yes	Good	Good	Very good	Good	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
PHENODUR PR 385	64 B	Yes	Yes	less dark	10-12	180-200	Yes	Good	Good	Very good	Good	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes
PHENODUR PR 401	72 B	Yes	Yes	Very bright	10-12	180-200	Yes	Medium	Good	Good	Good	Yes	Yes	No	Yes	Yes	Yes	No	No	No
PHENODUR PR 411	75 B	Yes	Yes	Very bright	10-12	190	Yes	Medium	Good	Good	Good	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes
PHENODUR PR 515	60 LG / 60 BX	Yes	Yes	Bright	10-12	200	Yes	Medium	Good	Medium	Poor	Yes	Yes	Yes	Yes	Yes	No	No	No	No
PHENODUR PR 516	60 B / 60 B LF	Yes	Yes	Bright	10-12	200	Yes	Good	Good	Good	Good	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
PHENODUR PR 517	60 B	Yes	Yes	Less dark	10-12	200	Yes	Very good	Good	Good	Very good	No	Yes	Yes	No	No	No	Yes	No	No
PHENODUR PR 520	65 B	Yes	Yes	Bright	10-12	200	Yes	Good	Good	Good	Good	No	Yes	Yes	No	No	No	Yes	No	No
PHENODUR PR 521	65 B	Yes	Yes	Less dark	10-12	180-200	Yes	Medium	Good	Very good	Good	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
PHENODUR PR 566	65 BX	Yes	Yes	Very bright	10-12	200	Yes	Very good	Very good	Medium	Good	No	Yes	No	No	No	Yes	Yes	No	No
PHENODUR PR 612	80 B	Yes	Yes	Less dark	10-12	200	Yes	Good	Very good	Good	Medium	No	Yes	Yes	No	Yes	No	Yes	Yes	No
PHENODUR PR 616	65 B	Yes	Yes	Less dark	10-12	200	Yes	Good	Very good	Good	Medium	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes
PHENODUR PR 722	53 BGB	Yes	Yes	Less dark	10-12	200	Yes	Very good	Very good	Good	Good	No	Yes	No	No	No	No	No	No	Yes
PHENODUR PR 787	50 MP	Yes	Yes	Less dark	10-12	200	No	Good	Good	Very good	Good	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes
PHENODUR PR 825	70 MPAC	Yes	Yes	Very bright	10-12	200	Yes	Very good	Very good	Medium	Good	Yes	Yes	No	No	Yes	Yes	Yes	No	No
PHENODUR PR 827	70 MPAC	Yes	Yes	Very bright	10-12	200	Yes	Very good	Very good	Medium	Good	Yes	Yes	No	No	Yes	Yes	Yes	No	No
PHENODUR PR 830	75 B	Yes	Yes	Very bright	10-12	200	Yes	Very good	Very good	Medium	Good	Yes	Yes	No	No	Yes	Yes	Yes	No	No
PHENODUR PR 897	53 BGB	Yes	No	Less bright	10-12	200	Yes	Good	Good	Very good	Good	No	Yes	Yes	No	No	No	No	No	No
PHENODUR PR 898	52 BGB	Yes	Yes	Less bright	10-12	200	Yes	Good	Good	Very good	Good	No	Yes	Yes	No	No	No	No	No	No
PHENODUR PR 899	60 MPAC	Yes	Yes	Less dark	10-12	200	Yes	Good	Good	Very good	Good	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
PHENODUR VPR 1785	50 MP , 65B	Yes	Yes	Less dark	10-12	200	Yes	Very good	Very good	Very good	Good	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes

Phenolic Resins for Special Usage

		Compatibility			Typical stoving conditions					Resistance		Applications								HazCom
Products	NV (solid content/ solvent)	With epoxy resins	With PVB	Color (cured film)	Time [min]	Temperature (°C)	Catalyst CYCAT® XK 406N	Wedge bend	Erichsen cup no. 2	Lactic acid 2% (1h-129°C)	Cysteine test (90min-121°C)	Coil for can	Can	Tubes	Drums	Metal foils	Silver lacquer	Bis-A/ BADGE free	Water borne	Free formaldehyde < 0.1%
Non-phenolic crosslinker for epoxy functional or polyester resins																				
PHENODUR VPM 1150	50 EPAC	Yes	n. a.	clear	10-12	200	-	Very good	Very good	Good		Yes	Yes	No	No	Yes	Yes	Yes	No	Yes
Coloring resin as additive																				
PHENODUR PR 307	63 XMP	Yes	Yes	very dark	n. a.	180-200	.	n. a.	n. a.	n. a.	n. a.	Coloring resin					No	Yes	No	Yes
PHENODUR PR 308	62 MP	Yes	Yes	very dark	n. a.	180-200	.	n. a.	n. a.	n. a.	n. a.	Coloring resin					No	Yes	No	Yes
PHENODUR PR 309	63 BMP	Yes	Yes	very dark	n. a.	180-200	.	n. a.	n. a.	n. a.	n. a.	Coloring resin					No	Yes	No	Yes

Typically ratios EP:Phenolics, PE:Phenolics or Phenolic:PVB 80:20 to 50:50
n. a. = not applicable

Product availability can vary by usage location. Please contact your local allnex representative regarding availability in specific countries and regions.

Water borne Phenolic Resins

		Compatibility			Typical stoving conditions					Resistance		Applications							HazCom
Products	NV (solid content/ solvent)	With epoxy resins	With PVB	Color (cured film)	Time [min]	Temperature (°C)	Catalyst CYCAT® XK 406N	Wedge bend	Erichsen cup no. 2	Lactic acid 2% (1h-129°C)	Cysteine test (90min-121°C)	Silver lacquer	Coil for can	Can	Tubes	Drums	Metal foils	Water borne	Free formaldehyde < 0.1%
PHENODUR® VPW 1942	52WA	n. a.	n. a.	n. a.	10 – 12	200 – 230	Yes	Good	Moderate	Good	Moderate	No	Yes	Yes	No	Yes	Yes	Yes	Yes
PHENODUR VPW 1946	46WA	n. a.	n. a.	n. a.	10 – 12	170 – 200	Yes	Good	Moderate	Good	Moderate	No	Yes	Yes	No	Yes	Yes	Yes	Yes
PHENODUR VPW 1947	50WA	Yes	n. a.	n. a.	10 – 12	170 – 200	Yes	Moderate	Moderate	Very Good	Good	No	Yes	Yes	No	Yes	Yes	Yes	No

Phenolic Resins for General Line

		Applications								
Products	Type	Primer	Topcoat	Inks	Powder coatings	Adhesives	Chemical resistance	Water/ corrosion resistance	Oil resistance	Properties and uses
PHENODUR® PR 263 / 70B	Phenolic resin	Yes	No	No	No	No	Yes	Yes	Yes	1K or 2K air drying and/or forced drying corrosion protection wash- and shop primer. Compared to BECKOPOX™ EM 460, faster drying, improved chemical resistance and less yellowing resistant.
PHENODUR PW 165/40WAMP	Modified epoxy resin	Yes	No	No	No	No	Yes	Yes	No	Formaldehyde-free modified epoxy resin for air drying or/and forced drying one-pack cationic wash primer.
PHENODUR VPR 1740/50WA	Phenol resol dispersion	Yes	No	No	No	Yes	Yes	No	No	Fast drying, low emission, low coloring, good leveling and adhesion, high chemical and thermal resistance, good compatibility to latizes based on SBR or acrylates. Binder for impregnations, adhesives, textiles and filters.
ALPEX® CK 450/PAST	Cyclized Rubber	No	No	Yes	NO	No	Yes	Yes	No	High chemical and scratch resistance; anti-corrosion and zinc-rich paints. Water tank coatings. Available as CK450/60WS.
ALPEX CK 514/PAST	Cyclized Rubber	Yes	No	No	No	No	No	No	No	Offsets, letterpress, screen printing inks. Reduces emulsification. Increased scratch resistance. Improved gloss, reduced flocculation.
ALNOVOL® PN 320/PAST	Novolac	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Insoluble in hydrocarbons; good compatability to PVB. Low emission; high reactivity to epoxy powders.
ALNOVOL VPN 1132/PAST	Novolac mod.	No	No	Yes	No	Yes	No	No	No	Generating long open time, lower activation temperature and high heat resistance for PUR adhesives. Improves flexibility of enamels.

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Definitions

Products	Type
B	n-butanol
IB	Iso-butanol
LG	Solvent mixture
X	Xylene
BG	Butylglycol (butyl cellosolve)
MPAC	Methoxy propyl acetate
MP	Methoxy propanol
EPAC	Ethoxy propyl acetate
WA	Water
WS	White Spirit
PAST	Pastilles

Notes