AMINO CROSSLINKERS

CYMEL® and SETAMINE® resins
CYCAT® - CATALYSTS FOR INDUSTRIAL COATINGS

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About allnex

allnex is a leading producer of industrial coating resins and additives for architectural, industrial, protective, automotive and special purpose coatings and inks. With manufacturing facilities and R&D centers located around the world, the allnex group offers access to a huge global network of innovation and provides responsive, local support to our customers, helping them to quickly bring advanced coating solutions to market. Formed in 2016 by the merger of two leading resin companies, we have recently further strengthened (y)our business by becoming part of major international player PTT Global Chemical.

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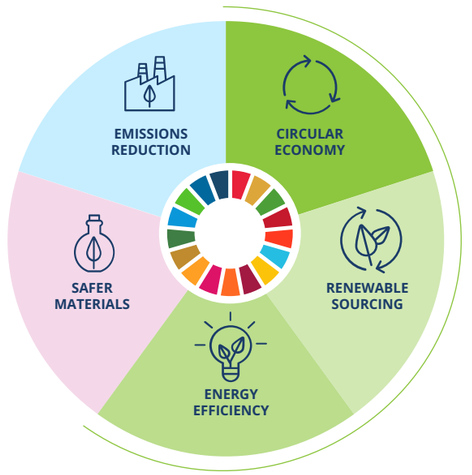
Sustainability

A fivefold focus for a new tomorrow – the pillars of our sustainability program.
These pillars form the basis of allnex's sustainability program, which covers all aspects from product development, raw material sourcing and manufacturing to supply chain management and customer service. The pillars stand for the circularity that is at the core of all our considerations, defining both how we plan and execute our activities.



Circular Economy
We diligently explore options to limit the consumption of resources, keep them in use as long as possible, and eventually recover and recycle them at the end of service life.

Renewable Sourcing
We aim at minimal use of finite resources and strive to reduce climate impacts by looking at renewable alternatives for raw materials and the energy we use.

Energy Efficiency
We design our product and manufacturing process in a way that enables maximum efficiency in energy utilization across the product lifecycle.

Safer Materials
We are committed to making the substitution of potentially harmful chemicals by safer options one of our guiding considerations.

Emissions Reduction
We work to reduce the emissions of volatile organic solvents across the product lifecycle to protect people and the environment.

Being ECOWISE™ is the best way to be part of the solution – and that's exactly what our initiative and ECOWISE™ branded products help everyone to do. They spring from our deep commitment to a more sustainable future. They are also living proof that, with our broad range of technologies and sustainable focus, we are the ideal partner for smoothly and successfully making the transition to the solutions a more ECOWISE™ future needs.

Amino resins
allnex's expertise in crosslinking technology is part of the company's corporate heritage and the foundation to its leadership in supplying the market with amino resins. This brochure provides product characteristics, compositional information and brief general comments on CYMEL® and SETAMINE® amino crosslinkers used in industrial coatings applications including automotive (OEM), wood kitchen cabinets & office furniture, metal food & beverage packaging, metal building products & general metal finishing. Our new CYMEL® NF series of formaldehyde-free crosslinkers are ideal for applications where formaldehyde emissions and content are a concern.

Goals in Research and Development
Several factors drive allnex's research and several factors drive allnex's research and development efforts. 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 long-standing needs of the industries we serve. Our technical specialists routinely visit customer locations worldwide to assist them in resolving problems and accelerating development of better products.

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 the 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.

High Solids Methylated Melamine resins

Highly Methylated Melamine resins
Highly methylated melamine resins consist of commercial versions of hexamethoxymethylmelamine (HMMM). They differ primarily in their degree of alkylation and monomer content. All are efficient crosslinking agents for hydroxyl, carboxyl and amide functional polymers. The practical equivalent weight for most of the resins is 130-180. Advantages are low VOCs, high film flexibility and toughness (when used with inherently flexible backbone resins), excellent formulation stability (especially in waterborne systems formulated at a pH of 8-9), good mar resistance and good intercoat adhesion properties. As typical with melamine resins, all are low in color and color development, have excellent exterior durability and good heat resistance. Due to their high extent of alkylation, the resins in this series require the addition of a strong acid catalyst for acceptable cure response when baked at 125-150°C. Typically, 0.2- 0.4% p-toluene sulfonic acid based on total binder solids is recommended. The optimum concentration of acid catalyst depends on the basicity of the other components in the formulation and should be determined experimentally. Using a blocking amine for the acid catalyst and adding a stabilizing alcohol to the formulation can enhance formulation stability.

Methylated High Imino Melamine resins
Methylated high imino melamine resins are partially methylolated and highly alkylated. These characteristics result in resins containing a significant concentration of alkoxy/imino or high NH functionality. The advantages are fast cure response at 120-150°C without the need for strong acid catalysts, fast cure response in waterborne formulations, high film hardness and low formaldehyde release on cure. In addition to reacting with hydroxyl, carboxyl and amide functionality on polymers, these resins also self-condense readily. Therefore, their practical equivalent weight is typically 180-240. In addition, they can be stabilized by adding tertiary amine and stabilizing primary alcohol to the formulation. Compared to their highly alkylated counterparts, the imino resins usually result in slightly less flexible coatings and slightly higher VOCs when used in solvent-based systems.

Partially Methylated Melamine resins
Partially methylated melamine resins are highly methylolated and partially alkylated. They cure well at 125-150°C without the need to add a strong acid catalyst. The acidity of most polymers used in thermoset coatings is sufficient to catalyze their reaction and their film performance properties are similar to those of the high imino resins mentioned in the previous category. In addition to reacting with the hydroxyl, carboxyl and amide functionality of polymers they also can self-condense readily. Their practical equivalent weight is also 180-240. As with all melamine resins, they can be stabilized by adding amine and stabilizing alcohol to the formulation. The major limitation of these products is high formaldehyde release on baking primarily due to their high free methylol content.

Product name	Non volatile content 45min- 45°C (%)	Solvent	Free Formalde-hyde (%)	Dyn. Viscosity 23°C (mPa*s)	Density 23°C (kg/m³) approx.	Xylene solubility	Water solubility	Comments
High Solids Methylated Melamine resins								
CYMEL® 300	98 minimum	none	< 0.25%	Waxy solid	1200	Complete	Insoluble	Closest composition to HMMM product line.
CYMEL® 301	98 minimum	none	< 0.2%	1550 - 4500	1200	Complete	Insoluble	Slightly lower alkylation than CYMEL® 300 resin. Desirable for waterborne.
CYMEL® 303 LF	98 minimum	none	< 0.1%	3000 - 6000	1200	Complete	Insoluble	Free formaldehyde < 0.1%.
CYMEL® 304	98 minimum	none	< 0.1%	4000 - 9000	1200	Complete	Insoluble	Fast curing version of HMMM for wood coatings. Free formaldehyde < 0.1%.
CYMEL® 350	97 minimum	none	< 0.99%	5100 - 16000	1200	Complete	Complete	Lower alkylation than CYMEL® 303 LF resin. Completely water soluble.
CYMEL® 3745	98 minimum	none	< 0.29%	2500 - 7500	1200	Complete	Insoluble	Similar in composition and film performance to CYMEL® 301 resin.
CYMEL® XW 3106	98 minimum	none	< 0.1%	4000 - 9000	1200	Complete	Insoluble	Designed for use in 2K ambient and forced dry systems for temperature sensitive substrates. Free formaldehyde < 0.1%.
Resins								
CYMEL® 323	76 - 82	iso-Butanol	< 0.7%	2500 - 7500	1120	Partial	Complete	Very fast cure response. Does not require strong acid catalyst. Low formaldehyde release.
CYMEL® 325	78 - 82	iso-Butanol	< 0.5%	2500 - 4500	1120	Partial	Partial	Fast cure response. Does not require strong acid catalyst. Low formaldehyde release.
CYMEL® 327	88 - 92	iso-Butanol	< 0.5%	5100 - 16000	1180	Partial	Complete	Fast cure and good stability. Does not require strong acid catalyst.
CYMEL® 328	83 - 87	Water	< 0.5%	1000 - 3000	1230	Insoluble	Complete	Waterborne version of CYMEL® 327 resin.
CYMEL® 385	76 - 81	Water	< 0.25%	1000 - 1600	1250	Insoluble	Complete	Very fast cure response in water based systems. Does not require strong acid catalyst. Low formaldehyde release.
Partially Methylated Melamine resins								
CYMEL® 370	86 - 90	iso-Butanol	< 0.99%	5100 - 10200	1180	Partial	Partial	General purpose. Fast Cure. Does not require strong acid catalyst.
CYMEL® 373	83 - 87	Water	< 0.6%	2500 - 6000	1260	Insoluble	Complete	Similar performance to CYMEL® 370 but supplied in water.
CYMEL® 380	76 - 82	iso-Butanol	< 2.5%	1200 - 3500	1200	Partial	Partial	Same composition as CYMEL® 370 but supplied at lower solids.

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High Solids Mixed Ether Melamine resins

Highly Alkylated Melamine resins
The highly alkylated melamine resins in this category are similar to the commercial versions of hexamethoxymethylmelamine (HMMM) except for the type of alkylation alcohol. The resins contain combinations of methoxy sites and longer chain length alkoxy sites (ethoxy, n-butoxy or iso-butoxy). They also differ from each other in their degree of alkylation and monomer content. Longer chain length alkoxy sites impart lower viscosity, improved flow and leveling and intercoat adhesion. All of the resins in the series are efficient crosslinking agents for hydroxyl, carboxyl and amide functional polymers. The practical equivalent weight for most is 140-200. Other advantages are low VOCs, high film flexibility and toughness when used with inherently flexible backbone resins and excellent formulation stability (especially in waterborne system at a pH of 8-9 and good mar resistance properties). Due to their high extent of alkylation, the resins in this series require the addition of a strong acid catalyst for acceptable cure response when baked at 125-150°C. Typically, 0.2-0.4% p-toluene sulfonic acid based on total binder solids is recommended. The optimum concentration of acid catalyst depends on the basicity of the other components in the formulation and should be determined experimentally. The use of a blocking amine for the acid catalyst and the addition of a stabilizing alcohol to the formulation should enhance formulation stability.

High Imino Melamine resins
The high imino melamine resins in this category are similar to those in the high imino methylated melamine series in that they are partially methylated and highly alkylated. They differ from methylated melamine resins in the type of alkylation alcohol, and they contain combinations of methoxy sites and n-butoxy sites. The butoxy sites impart improved flow and leveling and intercoat adhesion properties. As in the methylated series, their composition contains primarily alkoxy/imino or alkoxy/NH functionality. The advantages are fast cure response at 120-150°C without the need for strong acid catalyst addition, fast cure response in waterborne formulations, high film hardness and low formaldehyde release on cure. In addition to reacting with hydroxyl, carboxyl and amide functional polymers, the resins also self-condense readily. Therefore, their practical equivalent weight is typically 200-250. They too can be stabilized by the addition of amine and stabilizing alcohol addition to the formulation.

Product name	Non volatile content 45' - 45°C (%)	Solvent	Alkoxy ratio approx.	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa*s)	Density 23°C (kg/m³) approx.	Comments
Highly Alkylated Melamine resins							
CYMEL® 1130	96 minimum	none	Me/nBu = 3/1	< 0.1%	4000 - 7000	1130	Used in e-coat and high solids coatings.
CYMEL® 1133	98 minimum	none	Me/nBu = 1/1	< 0.1%	750-1950	1080	Used in high solids coatings. Good film flexibility and recoat adhesion.
CYMEL® 1141	83 - 87	iso-Butanol	Me/isoBu = 3/2	≤ 0.4%	1400-3000	1080	Carboxy functionality. Excellent adhesion to metals.
CYMEL® 1161	98 minimum	none	Me/isoBu = 3/1	< 0.1%	1050-2000	1130	Excellent intercoat adhesion. Low VOCs.
CYMEL® 1168	98 minimum	none	Me/isoBu = 1/1	< 0.1%	2000-4500	1080	Methylated-isobutylated version of CYMEL® 1133 resin. Excellent intercoat adhesion.
CYMEL® 3020	98 minimum	none	Me/nBu = 4/1	< 0.10%	900-1800	1120	Designed for automotive coating formulations with improved appearance.
High Imino Melamine resins							
CYMEL® 202	80 - 94	n-Butanol	Me/isoBu = 3/2	< 0.5%	2500-7500	1090	Low MW resin. Good balance of reactivity, film flex properties and humidity resistance.
CYMEL® 203	70 -74	n-Butanol	Me/nBu = 1/1	< 0.5%	400-800	1040	Excellent flow and leveling, adhesion properties.

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Butylated Melamine resins

Highly n-Butylated Melamine resins
Highly butylated melamine resins are similar to the commercial versions of hexamethoxymethylmelamine (HMMM), except they are n-butylated.
They also are slightly more oligomeric than their methylated counterparts. The butylation or butoxy sites impart improved flow, leveling and intercoat adhesion properties. However, cure response is slower than that of the resins in the methylated category. Yet, highly butylated melamine resins are efficient crosslinking agents for hydroxyl, carboxyl and amide functional polymers. The practical equivalent weight is 160-220. Other advantages are high film flexibility and toughness when used with inherently flexible backbone resins, excellent formulation stability and good mar resistance properties. Due to their high extent of alkylation, the resins require the addition of a strong acid catalyst for acceptable cure response when baked at 125-150°C. Typically 0.2-0.4% p-toluene sulfonic acid based on total binder solids is necessary. The optimum concentration of acid catalyst depends on the basicity of the other components in the formulation and should be determined experimentally. The use of a blocking amine for the acid catalyst and the addition of a stabilizing alcohol to the formulation should enhance formulation stability.

n-Butylated Melamine resins
n-butylated resins in this category are very polymeric in nature. They differ in extent of methylolation, butylation and polymerization. In general, higher extents of methylolation and butylation result in more hydrophobic resins with lower viscosities, higher stability, slightly higher film flexibility, film gloss and adhesion but slower cure response. Higher extents of polymerization result in faster film property development but also in higher viscosities and therefore higher VOCs. None of the resins in this category require the addition of a strong acid catalyst for adequate cure at 125-150°C. Usually, the acidity of the other resin components in the formulation results in sufficient catalysis. In addition to reacting with hydroxyl, carboxyl and amide functionalities on polymers, these resins self-condense readily.
Their practical equivalent weight is typically 220-280 on a solids basis, and high concentrations of the melamine resins in the formulation result in high film hardness and improved exterior durability. However, this may also yield lower film flexibility and lower adhesion properties. They too can be stabilized by adding amines and stabilizing alcohol to the formulation.

n-Butylated High Imino Melamine resins
Butylated high imino melamine resins are similar to those in the high imino methylated melamine series as they are partially methylolated and highly alkylated. They differ from the high imino methylated melamine resins in that they are n-butylated. The butoxy sites impart improved flow, leveling and intercoat adhesion properties. As in the methylated series, their composition contains primarily alkoxy/imino or alkoxy/NH functionality. The advantages are fast cure response at 120-150°C without the need to add a strong acid catalyst, high film hardness and low formaldehyde release on cure. In addition to reacting with hydroxyl, carboxyl and amide functionality on polymers, the resins self-condense readily. Therefore, their practical equivalent weight is typically 160-220. They can be stabilized by the addition of an amine and a stabilizing alcohol to the formulation.

iso-Butylated Melamine resins
The iso-butylated melamine resins in this category are similar to polymeric n-butylated resins and differ only in that they are “iso” rather than “n”-butylated. It is generally believed that iso-butylated melamine resins cure faster than n-butylated resins, although differences in extent of methylolation, alkylation and polymerization are believed to be more significant factors with respect to cure response. The comments made previously concerning the n-butylated resins also apply to the iso-butylated resins.

Product name	Non volatile content 45min - 45°C (%)	Solvent	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa·s)	Density 20°C (g/cc) approx.	Acid number (mg KOH/g)	Comments
Highly n-Butylated Melamine resins							
CYMEL® 1156	96 (1)	n-Butanol	< 0.2%	3800 - 7500	1.05		Good resistance properties when cured adequately. Very hydrophobic
CYMEL® MB-94	94 - 97 (1)	n-Butanol	< 0.1%	2400 - 3800			Improves the water resistance of UF wood finishes. Very hydrophobic.
CYMEL® MB-98	96 (1)	n-Butanol	< 0.1%	1700 - 4500	1.04	0.25 - 1.0	Used for improved resistance properties in acid curing industrial wood applications.
n-Butylated High Imino Melamine resins							
CYMEL® 1158	78 - 82 (1)	n-Butanol	< 1.2%	3000 - 7000	1.05		High solids. Fast cure response.
CYMEL® 1158LF	78 - 82 (1)	n-Butanol	< 0.5%	3000 - 7000	1.05		High solids. Fast cure response. Low HCHO release.
n-Butylated Melamine resins							
CYMEL® 247-10	62 - 66 (3)	n-Butanol	< 3.5%	850 - 1900		1.0 max	Excellent compatibility, flow and leveling.
CYMEL® 651E	58 - 62 (4)	n-Butanol / Xylene	< 1.0%	1000 - 2000	1.01	0.8 max	Very good film hardness development, excellent flow and wetting properties.
Iso-Butylated Melamine resins							
CYMEL® MI-12-I	58 - 62 (2)	iso-Butanol	< 0.6%	1050 - 1950	0.97	0 - 1.6	For fast drying general industrial stoving applications, especially for primer formulations.
CYMEL® MI-97-IX	68 - 72 (2)	iso-But / Xylene	< 0.6%	480 - 760	1.01	1 - 3	Very fast curing. Good compatibility.

(1) = Foil solids 45' at 45°C (2) = Pan solids 60' at 100°C (3) = Pan solids 120' at 105°C (4) = Pan solids 120' at 120°C

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High Solids Urea resins

Methylated resins
Methylated urea resins were designed for waterborne and solvent-based formulations for interior and non-UV resistant applications. They differ from each other primarily in their extent of methylolation and methylation. As with other amino resins for coatings, higher extents of alkylation result in improved compatibility with most binders, improved stability, better flow and leveling - but slower cure response. These resins require the addition of a strong acid catalyst for acceptable cure response at 125°C. For very low temperature cure systems - for example, those for wood finishes - a 2-component formulation is necessary. In such formulations, the acid catalyst is added to the fully-formulated system just prior to use. If the bake temperature is around 70°C, a concentration of 1-2% on total binder solids of a strong or weak acid is recommended. In general, urea resins react with the hydroxyl, carboxyl and amide functional sites on polymers, but they also have a high tendency for self-condensation. Their practical equivalent weight is in the range of 180-260. The use of a blocking amine for the acid catalyst and the addition of a stabilizing alcohol to the formulation enhances formulation stability. The latter approach is recommended for 2-component formulations.

Butylated resins
The one resin in this category, CYMEL® U-80 resin, is similar in composition to several of the methylated resins except that its alkylation alcohol is n-butanol. This resin is also recommended for interior and non-UV resistant coatings; it is used primarily in solvent-based systems. It is very hydrophobic and stable but slower curing than its methylated counterparts. A strong acid catalyst is recommended for acceptable cure response at 125°C. Other formulation details are the same as those given for methylated resins.

Product Name	Non Volatile content 45' at 45°C (%)	Solvent	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa*s)	Density 23°C (kg/m³) approx.	Water Solubility	Xylene Solubility	Comments
Methylated resins								
CYMEL® U 65	96 minimum	Methanol	≤ 0.4	5000 - 18000	1200	Complete	Insoluble	Good compatibility and cure response.
CYMEL® UM 15	96 minimum	Methanol	< 0.5	6800 - 17000	1200	Complete	Insoluble	Good compatibility and cure response.
Butylated resins								
CYMEL® U 80	96 minimum	n-Butanol	< 0.1	1700 - 4500	1200	Insoluble	Complete	Very hydrophobic. Excellent water resistance properties when cured properly.

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Butylated Urea resins

n-Butylated Urea resins
The urea resins in this category are all partially n-butylated and very polymeric in nature. They differ in extent of methylolation, butylation, and polymerization. In general, higher extents of methylolation and butylation result in more hydrophobic resins with lower viscosities, higher stability, slightly higher film toughness, film gloss and adhesion but a slower cure response. Higher extents of polymerization result in faster film property development but also in higher viscosities and therefore, higher VOCs. None of the resins require the addition of a strong acid catalyst for adequate cure at 125°C. Usually, the acidity of the other resin components in the formulation is sufficient for catalysis. In addition to reacting with hydroxyl, carboxyl and amide functional polymers, the resins also self condense readily. Their practical equivalent weight is typically 220-300 on a solids basis. High concentrations of the urea resins in the formulation result in high film hardness, but possibly lower film toughness and lower adhesion properties. They can be stabilized by amine and stabilizing alcohol addition to the formulation. As with other urea resins, they are recommended for interior, non-UV resistant applications. The most typical applications are interior container coatings and 2-component solvent-based wood finishes. In the latter application, the acid catalyst is added to the fully-formulated system just prior to use. A concentration of 1-2% on total binder solids of a strong or weak acid is recommended for systems that require low bake temperatures - typically less than 70°C.

iso-Butylated Urea resins
The iso-butylated urea resins in this category are similar to the polymeric n-butylated resins, except that they are iso-butylated rather than n-butylated. It is generally believed that iso-butylated urea resins cure faster than n-butylated resins, although differences in extent of methylolation, alkylation and polymerization are believed to be more significant factors with respect to cure response. iso-butylated urea resins perform in much the same way as n-butylated urea resins. That is, high concentrations of these resins in the formulation result in high film hardness, but possibly lower film toughness and lower adhesion properties. iso-butylated resins can be stabilized by adding amine and stabilizing alcohol to the formulation. They are recommended for interior and non·UV resistant applications as well.

Product Name	Non Volatile %	Solvent	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa·s) Viscosity 72°F (Gardner-Holdt)	Density 20°C (g/cc) approx.	Acid number (mg KOH/g)	Comments
n-Butylated Urea resins							
CYMEL® U-21-511	58 - 62 (2)	n-But / Ethanol	< 0.5%		1.03	2 - 5	Exempt solvent version of CYMEL® U-21-510 resin.
CYMEL® U-21-510	58 - 62 (2)	n-Butanol / Xylene	≤ 0.45%		1.03	2 - 5	
CYMEL® U-216-8	57 - 61 (3)	n-Butanol / Xylene	< 1.0%	600 - 1500	1.04	0.5 - 2.0	
CYMEL® U-216-10 LF	58 - 62 (3)	n-Butanol	< 0.65%	S - V	1.01		Low free formaldehyde for metal deco, can and coil coating primers.
CYMEL® U-227-8	49 - 55 (3)	n-But / Xylene	< 1.5%	1700 - 4500	1.00	1 - 4	General purpose butylated urea formaldehyde resin.
CYMEL® U-1050	49 - 55 (3)	n-Butanol / Xylene	< 0.5%	X - Z1	1.00	1 - 4	For fast cure industrial bake and low temperature cure wood conversion varnishes.
CYMEL® U-1050-10	58 - 62 (3)	n-Butanol	≤ 0.8%	Z-Z2	1.01	1 - 4	CYMEL® U-1050 resin supplied in n-butanol.
CYMEL® U-1052-8	54 - 58 (3)	n-But / Xylene	< 1.5%	500 - 1300	1.04	2 - 2.7	Fast-curing, compatible resin. Suitable for epoxy systems.
CYMEL® U-1054	58 - 62 (3)	n-But / Ethanol	< 1.0%		1.05	5 - 7	Fast-curing, compatible resin. Suitable for epoxy systems.
CYMEL® U-610	65 - 69 (4)	n-But / Xylene	< 1.8%	10000 - 13000	1.05	2 - 3	For general industrial baking applications especially for metal decorating primer formulations.
CYMEL® U-640	58 - 62 (4)	n-But / Xylene	< 1.0%	800 - 1400	1.02	2 - 4	For general stoving primer formulations with excellent flow and levelling properties.
CYMEL® UB-24-BX	61 - 65 (5)	n-But / Xylene	< 0.7%	1700 - 2600	1.02	2 - 5	For general industrial stoving finishes when electrostatic spray application is required.
CYMEL® UB-26-BX	61 - 65 (5)	n-But / Xylene	< 0.7%	1700 - 2600	1.02	2 - 5	For general industrial stoving finishes and primer formulations.
CYMEL® UB-25-BE	61 - 65 (5)	n-But / Ethanol	< 0.7%	1000 - 3000	1.02	1.5 - 3.5	Fast-curing resin for wood finishes and general metals.
CYMEL® UB-30-B	63 - 67 (5)	n-Butanol	< 0.6%	13000 - 25000	1.03	1-3	Fast-curing resin for wood finishes and general metals.
iso-Butylated Urea resins							
CYMEL® U-662	58 - 62 (4)	iso-But / Xylene	< 0.3%	1200 - 2400	1.01	0.75 - 1.5	Medium-high reactivity. Recommended for wood finishes. Low HCHO emission.
CYMEL® U-663	60 - 64 (4)	iso-Butanol	< 0.3%	2400 - 4500	1.00	0.75 - 1.5	Medium-high reactivity. Recommended for wood finishes. Low HCHO emission.
CYMEL® U-1051	58 - 62 (3)	iso-But / Xylene	≤ 0.35%	1800 - 4400	1.01	2 - 10	Fast cure and excellent compatibility.
CYMEL® UI-19-I	61 - 64 (5)	iso-Butanol	≤ 0.8%	8700 - 16000	1.02	0.5 - 2	Fast curing resin for wood finishes. Low formaldehyde emission.
CYMEL® UI-19-IE	58 - 62 (5)	iso-Butanol / Ethanol	<1.0%	1700 - 3500	1.00	0.5 - 2	For fast drying acid curing wood coating formulations with low odor requirements.
CYMEL® UI-20-E	76 - 80 (5)	Ethanol	< 0.5%	1700 - 3500	1.01	0 - 1	High film build wood coatings.
CYMEL® UI-21-E	76 - 80 (5)	Ethanol	< 0.5%	2500 - 4500	1.01	0 - 1	Good cure speed. General purpose resin.
CYMEL® UI-27-EI	58 - 62 (5)	Ethanol / iso-But	< 0.5%	350 - 600	1.01	1 - 3	Good cure speed. Compatible with nitrocellulose systems.
CYMEL® UI-38-I	67 - 71 (5)	iso-Butanol	< 1.0%	12000 - 20000	1.03	2 - 4	Used in primers and topcoats for metal substrates. High resistivity.

Benzoguanamine and Glycoluril resins

Benzoguanamlne resins
Benzoguanamine resins are similar to melamine-based resins in that they too are triazine based, but in this instance the triazine has a benzene group substitution. Therefore, they are less functional than melamine-based resins and are not UV resistant.
Benzoguanamine resins are noted for their enhanced film flexibility/toughness and for their chemical resistance. They are typically used in primers, container coatings and appliance finishes. Usually, highly alkylated, monomeric benzoguanamine resins result in higher film flexibility than that which can be achieved with other types of resins, but they also require the addition of a strong acid catalyst for adequate cure at temperatures greater than 125°C. Their practical equivalent weights are slightly higher than the practical weights of their melamine counterparts and range from 160-220.
The less alkylated polymeric resins only require the acidity of the other components in the formulation to cure adequately at greater than 125°C, but they have higher VOCs in a solvent-based formulation. Their practical equivalent weights are also slightly higher than those of their melamine counterparts and range from 200-260 on a solids basis. The use of a blocking amine and the addition of a stabilizing alcohol to the formulation should enhance formulation stability.

Glycoluril resins
Glycoluril resins are similar to their melamine resins counterparts in that they too are based on a ring structure, glycoluril. Similar to benzoguanamine resins, they are less functional than melamine resins but are UV resistant and can be used in exterior coatings.
Their advantages are film toughness and flexibility, ability to adhere to metals and low formaldehyde release on curing. There are two categories in the product line, that of unalkylated methylol glycoluril resins, and those which are highly alkylated. CYMEL® 1172 is unalkylated and was designed for water-based coatings with low temperature cure performance properties. The highly alkylated resin, CYMEL® 1170, was designed to replace HMMM where there is a desire to improve film flexibility. The same comments concerning highly alkylated monomeric melamine resins also apply to the alkylated glycoluril resins.

Product Name	Non Volatile %	Solvent	Alkoxy Ratio Approx.	Free Formaldehyde (%)	Dyn. Viscosity 20°C (mPa*s)	Density 20°C (kg/m³) Approx.	Water Solubility	Xylene Solubility	Comments
Benzoguanamine resins									
CYMEL® 1123	98 minimum [2]		Me/Eth = 55/45	< 0.2%	3800 - 10200	1170	Insoluble	Complete	For high quality industrial primer formulations which provide excellent film flexibility and adhesion.
CYMEL® 5010B	64 - 68 [3]	n-Butanol	n-Butyl	< 0.5%	300 - 800	1000	Insoluble	Complete	Polymeric general purpose resin. HAPS Free.
CYMEL® 659 E	70 - 74 [1]	Butanol	n-Butyl	< 0.6%	650 - 1200	1065	Insoluble	Complete	Excellent adhesion and corrosion resistance for direct to metal coatings.
Glycoluril resins									
CYMEL® 1170	98 minimum [2]	n-Butanol	n-Butyl	< 0.35%	3000 - 6000	1070	Insoluble	Complete	Highly butylated, highly monomeric resin. Very hydrophobic. Excellent film flex.
CYMEL® 1172	43 - 47 [3]	Water	Unalkylated	< 1.0%	< 50	1210	Complete	Insoluble	Unalkylated resin for WB finishes. Fast curing.

[1] = Pan solids 120' at 120°C [2] = Foil solids 45' at 45°C [3] = Pan solids 120' at 105°C

Formaldehyde Free resins

CYMEL® NF 2000A
CYMEL® NF 2000A crosslinking agent is a unique trifunctional melamine-based crosslinker containing reactive carbamate functionality. It can be used to crosslink hydroxy- and epoxy containing polymers to give highly durable, acid-resistant films that exhibit a favorable balance of hardness and flexibility. An important feature of CYMEL® NF 2000A is that it does not contain or emit formaldehyde on cure. It can be employed as the sole crosslinker in a coating or ink formulation, or it may be used at lower levels in combination with other crosslinkers - such as conventional amino resins or isocynanates - in order to obtain a balance of properties. CYMEL® NF 2000A is recommended for high quality durable finishes such as automotive topcoats, exterior can varnishes and coil coatings. CYMEL® NF 2000A reacts with hydroxy functional backbone resins at >125°C bake schedules to form urethane linkages. Cure can typically be accomplished without use of a catalyst to yield films that exhibit excellent hardness, chemical resistance, exterior durability and environmental etch resistance. Addition of low levels of acid catalyst (e.g. 0.5% dodecyl benzene sulfonic acid on binder solids) has been found to improve humidity resistance properties in some systems. Both catalyzed and uncatalyzed formulations show good 1K package stability at 23°C. CYMEL® NF 2000 will react with carboxy functional backbone resins, but require bake temperatures >150°C.

CYMEL® NF 3030
CYMEL® NF 3030 is the waterborne version of CYMEL® 3041. CYMEL® NF 3030 contains no organic solvent and therefore no solvent is released on cure, allowing for formulation of ultra-low VOC coating systems. Pairing with VIACRYL® SC 6834w/42WA nonionic acrylic emulsion allows for the formulation of a two-pack ambient or low bake system for industrial wood applications with superior catalyzed pot life relative to isocyanate-based systems. Coatings are typically sandable in 30-45 minutes following coating application under ambient conditions. The finished coating provides a balance of properties including early hardness development, chemical resistance, cold check resistance and very good appearance with minimal grain-raising.

CYMEL® NF 3041
CYMEL® NF 3041 is a partially n-butylated crosslinking agent designed for two-pack ambient and heat cured formulations for industrial wood and plastic applications. These systems have excellent early hardness, resistance properties, appearance and hot/cold cycle flexibility. CYMEL® NF 3041 is a very effective crosslinking agent for alkyd, polyester and acrylic polymers containing primary hydroxyl functionality. CYMEL® NF 3041 resin requires the addition of an acid catalyst to the formulation in order to obtain effective cure for both ambient and heat cured applications. It is recommended to use 2.0% CYCAT® 500 based on weight of total binder solids. However, the acidity of other formulation components may affect the reaction rate and should be evaluated in combination with the catalyst. Catalyzed potlife can be extended by the addition of 10 to 20% primary alcohol on total binder solids. Methanol or ethanol is preferred to ensure early hardness development and sandability. The coatings demonstrate very good flow, gloss, early film hardness, early print resistance and chemical resistance.

Product Name	Non volatile content (%)	Solvent	Dyn. Viscosity 23°C (mPa*s)	Density 20°C (g/cc) approx.	Water Solubility	Xylene Solubility	Comments
CYMEL® NF 2000A	48 - 52 [2]	Butanol	10 - 50	0.95	Insoluble	Complete	Formaldehyde free, high performance, heat cured coatings.
CYMEL® NF 3041	62 - 66 [1]	Butanol	300 - 1000	1.00	Insoluble	Complete	Formaldehyde free, industrial wood coatings.
CYMEL® NF 3030	40 - 45 [3]	Water	< 300	1.17	Soluble	Insoluble	Formaldehyde free, industrial wood coatings, no VOC.

[1] = Foil solids 45' at 45°C [2] = Pan solids 120' at 105°C [3] = Pan Solids 60' at 125°C

Please contact your local allnex representative regarding our full portfolio and product availability in specific countries and regions.

SETAMINE® resins

SETAMINE® resins are amino crosslinkers developed and supplied to the market by Nuplex resins prior to the merger with allnex. The SETAMINE® product portfolio includes butylated melamine-formaldehyde resins used primary for automotive top coats.

Product Name	Non Volatile by Weight (%)	Solvent	Free Formaldehyde (%)	Dynamic Viscosity 23°C (mPa-s)	Density 23°C (kg/m^3)	Acid Value (mg KOH/g)	Comments
Butylated Melamine-Formaldehyde resins							
SETAMINE® US-138 BB-70	68 - 72	n-Butanol	≤ 0.4	1100 - 1700	1.03	0.3 max	Used in automotive topcoats. Very good compatibility, high reactivity with low viscosity, excellent sprayability, good petrol and acid resistance, high gloss.
SETAMINE® US-146 BB-72	70 - 74	n-Butanol	≤ 0.4	1500 - 4500	1.04	0.7 max	Used in automotive OEM clearcoats in combination with thermosetting acrylic resins. Excellent appearance and gloss, excellent water resistance, high reactivity, good acid resistance, good mechanical properties.
SETAMINE® US-132 BB-71	69 - 73	n-Butanol	≤ 0.8	700 - 1100	1.05	1.5 max	Used in low bake or forced dry (80°C) finishes, such as car body repair finishes. Good film hardness, body, gloss, and alkali resistance.
SETAMINE® US-146 BX-65	65 - 67	n-Butanol / Xylene	~ 0.3	600 - 1200	1.02	0.7 max	Used in automotive OEM clearcoats in combination with thermosetting acrylic resins. Excellent appearance and gloss, excellent water resistance, high reactivity, good acid resistance, good mechanical properties.
SETAMINE® US-144 BB-60	58 - 62	n-Butanol	≤ 0.4	500 - 1000	0.99	1.2 max	In combination with thermosetting acrylic resins: automotive top coats (particularly clear coats). Very good compatibility, excellent sprayability, good petrol and acid resistance, excellent appearance and gloss.

Catalysts for Industrial Coatings

CYCAT® Catalysts
allnex supplies acid catalysts for accelerating the cure response of amino crosslinking agents. Each catalyst is designed to fulfill a specific applications requirement, and in most cases, one catalyst will be preferable over another depending on formula composition and curing conditions.

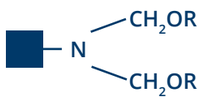
Catalyst Selection Criteria
The reaction of amino resins and polyols is complex and often requires acidic catalysts. The relative efficiency of catalysts correlates to the acidity, and the overall reaction rate is directly proportional to the concentration of the catalyst. Frequently used catalysts are p-toluenesulfonic acid (PTSA), dodecylbenzenesulfonic acid (DDBSA), dinonylnaphthalenesulfonic acid (DNNSA), dinonylnaphthalenedisulfonic acid (DNNDSA) and organic phosphoric acid esters.

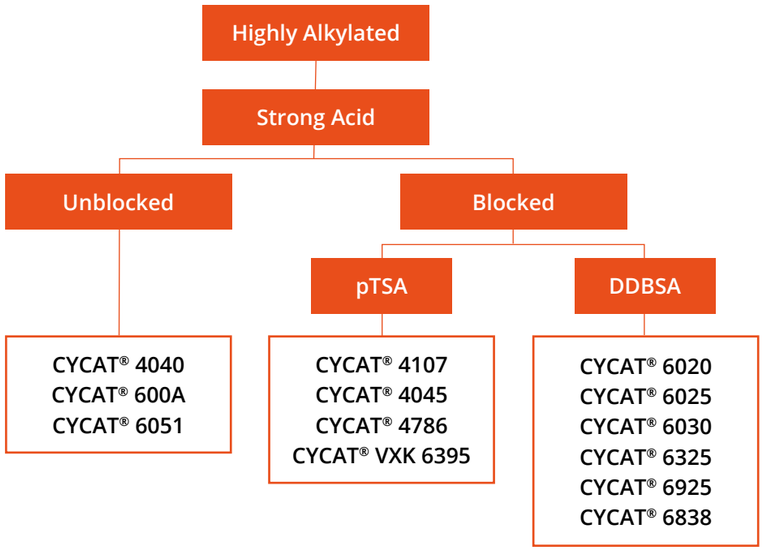
Ionic or covalently blocked sulfonic acid catalysts are used in amino resin-based stoving systems. The deactivation of the sulfonic acid is a very important tool to achieve the desired balance of storage stability of a catalyzed system followed by rapid cure when the coating reaches the desired temperature.

Acid Types
Strong acids are most effective for highly alkylated melamine, benzoguanamine and all urea-formaldehyde resins.
Weak acids are most effective for both the crosslinking and self-condensation reactions of resins which are subject to general acid catalysis. Thus, high NH containing resins and partially alkylated melamine-formaldehyde resins and all conventional butylated resins benefit most by the use of weak acids as catalysts. However, for high temperature bake OEM auto clear coats, dodecylbenzenesulfonic acid (DDBSA) catalyst are also very effective. Weak acids include mono and alkyl phosphates, phosphoric acid, carboxylic acids, and pyrophosphates such as CYCAT® 296-9 catalyst. CYCAT® XK 406N catalyst is especially designed for phenolic resins.

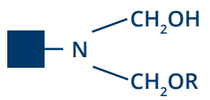
Catalyst Selection

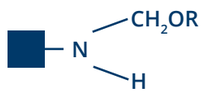
Highly alkylated

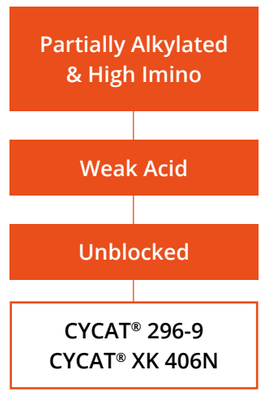




Partially alkylated & High Imino







Product Name	Acid Type Volatile	% Active	Acid #	Density g/ml	Gardner Color	Minimum Cure	Attributes / Uses	Applications
CYCAT® Acid Catalysts								
CYCAT® 296-9	DMAP Isobutanol	50	155 - 165	1,06	1	110°C	Weak acid for high NH/polymeric melamine and phenolic crosslinkers.	GI
CYCAT® XK 406N	Phosphate Xylene/Butanol	9.1	100 - 112	0,90	2	80°C	Complies with FDA 21 CFR, Sec. 175.300 (b) (3) xiii (a&b), mainly for phenolic resins.	Packaging
CYCAT® 600A	DDBSA Isobutanol	70	130 - 140	0,96	4	RT	General purpose catalyst. Excellent water, detergent and salt spray resistance. Excellent solubility characteristics, complies with FDA 21 CFR, Sec. 175.300 (b) (3) xiii (a&b).	Auto, Packaging
CYCAT® 4040	p-TSA Isobutanol	40	130 - 140	0,98	1	RT	Most versatile and polular catalyst.	GI
CYCAT® 6051	DNNSA Butanol	50	60 - 65	0,95	<18	125°C	Best water and corrosion resistance for high temperature applications on metal.	GI, Coil
CYCAT® Blocked p-TSA Catalysts								
CYCAT® 4045	p-TSA Ethylene glycol	20		1,16	1	100°C	Excellent formulated package stability and flow properties., Coil, G.I.	GI, Coil
CYCAT® 4107	p-TSA Isopropanol	25		0,90	1	90°C	Good metal mark resistance. GI, Coil.	GI, Coil
CYCAT® 4786	p-TSA n-Butanol	30		0,98	1	80°C	Low temperature cure. Excellent stability. Coil, G.I.	GI, Coil
CYCAT® VXK 6364	p-TSA Isopropanol	50		0,95	1	120°C	Recommended for higher temperature cure; provides improved leveling in melamine crosslinked polyester systems.	GI, Coil
CYCAT® VXK 6395	p-TSA Isopropanol	25		0,95	1	80°C	Low temperature cure. Excellent stability.	GI, Coil
CYCAT® Blocked DDBSA Catalysts								
CYCAT® 6020	DDBSA Isopropanol	40		0,90	2	120°C	Best appearance, excellent color automotive clear coat.	Automotive, GI
CYCAT® 6025	DDBSA Isopropanol	25		0,85	2	120°C	Balanced performance for auto top coat, general industrial.	Automotive, GI
CYCAT® 6030	DDBSA Isopropanol	30		0,90	2	120°C	Faster cure response than CYCAT® 6020 and 6025. Automotive clear coat	Automotive, GI
CYCAT® 6325	DDBSA Isopropanol	25		0,90	2	120°C	Broad solubility. Excellent color stability., automotive clear coat, G.I.	Automotive, GI
CYCAT® 6838	DDBSA Xylene	25		0,95	5	120°C	Very low conductivity, corrosive resistance, good adhesion, and great film appearance	Automotive, GI, Coil
CYCAT® 6925	DDBSA Isopropanol	25		0,90	2	120°C	Complies with FDA 21 CFR, Sec. 175.300 (b) (3) xiii (a&b), Packaging.	Automotive, GI, Packaging

Notes

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