

AMINO CROSSLINKERS

Product Guide - Cymel® and Setamine® Resins
Americas - Europe - Asia (outside Greater China)



About allnex



Facts & Figures

- Global company with over €2 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 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

Amino Resins

allnex's expertise in crosslinking technology is part of our corporate heritage and the foundation to our 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, Original Equipment Manufacturers (OEM), kitchen cabinets, metal food and beverage packaging, metal building products and general metal finishing.

Our new CYMEL formaldehyde-free crosslinkers are ideal for applications where formaldehyde emissions and content are a concern.

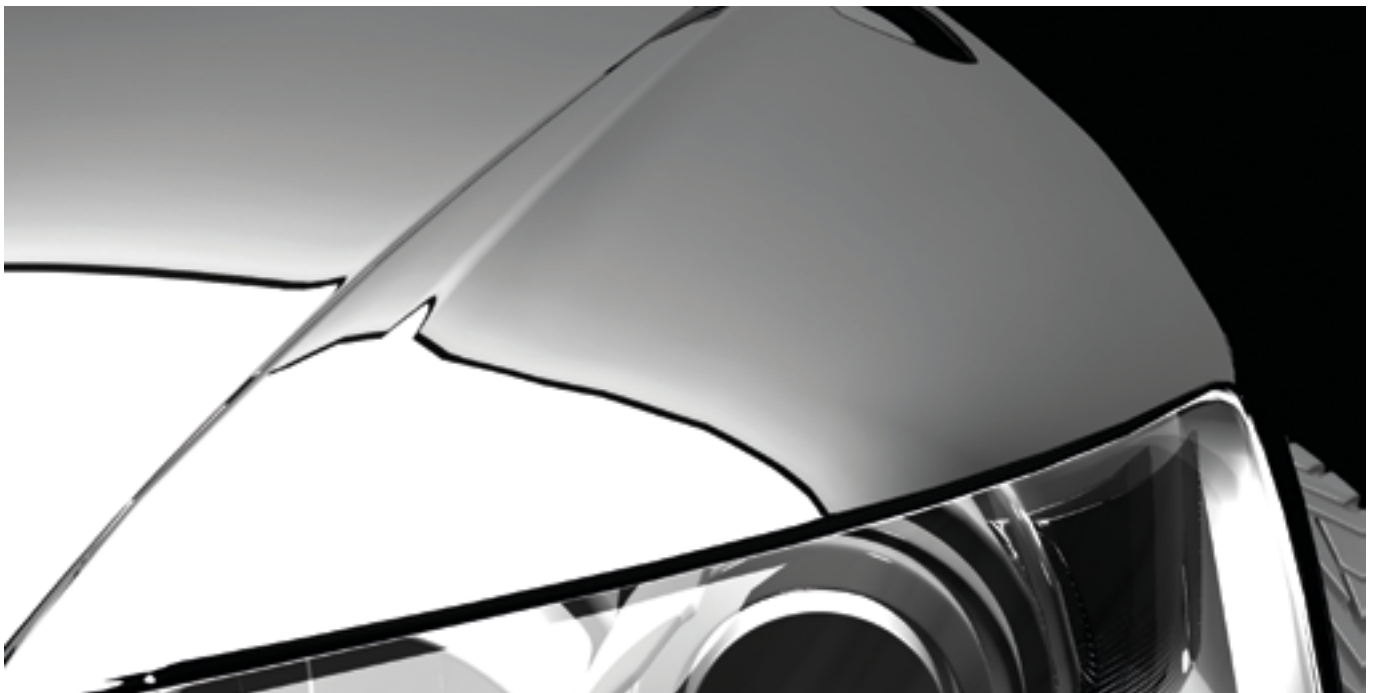
Amino crosslinkers are used with epoxy, polyester, acrylic and alkyd resins and provide the desired balance of flexibility, exterior durability, chemical resistance and film toughness.

allnex's Goals in Research and Development

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.

Product name	Non volatile content 45min- 45°C (%)	Solvent	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa*s)	Density 23°C (kg/m ³) approx.	Xylene solubility
High Solids Methylated Melamine Resins						
CYMEL 300	98 minimum	-	<0.25%	Waxy solid	1200	Complete
CYMEL 301	98 minimum	-	<0.2%	1550-4500	1200	Complete
CYMEL 303 LF	98 minimum	-	<0.1%	3000-6000	1200	Complete
CYMEL 304	98 minimum	-	<0.1%	4000-9000	1200	Complete
CYMEL 350	97 minimum	-	<1.7%	5100-16000	1200	Complete
CYMEL 3745	98 minimum	-	<0.5%	2500-7500	1200	Complete
CYMEL XW 3106	98 minimum	-	<0.1%	4000-9000	1200	Complete
CYMEL MM-100	99 minimum	-	0,40%	10000-25000	1200	Complete
High Imino Resins						
CYMEL 323	76-82	-	<0.7%	2500-7500	1120	Partial
CYMEL 325	78-82	iso-Butanol	<0.75%	2500-4500	1120	Partial
CYMEL 327	88-92	iso-Butanol	<0.8%	5100-16000	1180	Partial
CYMEL 328	83-87	Water	<0.5%	1000-3000	1230	Insoluble
CYMEL 385	76-81	Water	<0.4%	1000-1600	1250	Insoluble
Partially Methylated Melamine Resins						
CYMEL 370	86-90	iso-Butanol	<3.5%	5100-10200	1180	Partial
CYMEL 373	83-87	Water	<2.1%	2500-6000	1260	Insoluble
CYMEL 380	76-82	iso-Butanol	<3.5%	1200-3500	1200	Partial

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

methylated 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.

Water solubility	Comments
Insoluble	Closest composition to HMMM product line.
Insoluble	Slightly lower alkylation than CYMEL 300 resin. Desirable for waterborne.
Insoluble	Free formaldehyde < 0.1%.
Insoluble	Fast curing version of HMMM for wood coatings. Free formaldehyde < 0.1%.
Complete	Lower alkylation than CYMEL 303 LF resin. Completely water soluble.
Insoluble	Similar in composition and film performance to CYMEL 301 resin.
Insoluble	Designed for use in 2K ambient and forced dry systems for temperature sensitive substrates. Free formaldehyde < 0.1%.
Insoluble	More oligomeric than CYMEL 303LF resin. Good water resistance.
Complete	Very fast cure response. Does not require strong acid catalyst. Low formaldehyde release.
Partial	Fast cure response. Does not require strong acid catalyst. Low formaldehyde release.
Complete	Fast cure and good stability. Does not require strong acid catalyst.
Complete	Waterborne version of CYMEL 327 resin.
Complete	Very fast cure response in water based systems. Does not require strong acid catalyst. Low formaldehyde release.
Partial	General purpose. Fast Cure. Does not require strong acid catalyst.
Complete	Similar performance to CYMEL 370 but supplied in water.
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

Product name	Non volatile content 45min- 45°C (%)	Solvent	Alkoxy ratio approx.	Free Formaldehyde (%)
Highly Alkylated Melamine Resins				
CYMEL 1116	98 minimum	-	Me/Eth = 2/3	<0.2%
CYMEL 1130	96 minimum	-	Me/nBu = 3/1	<0.1%
CYMEL 1133	98 minimum	-	Me/nBu = 1/1	<0.1%
CYMEL 1141	83-87	iso-Butanol	Me/isoBu = 3/2	<1.0%
CYMEL 1161	98 minimum	-	Me/isoBu = 3/1	<0.1%
CYMEL 1168	98 minimum	-	Me/isoBu = 1/1	<0.1%
CYMEL 3020	98 minimum	-	Me/nBu = 4/1	0,10%
High Imino Melamine Resins				
CYMEL 202	80-94	n-Butanol	Me/isoBu = 3/2	<0.6%
CYMEL 203	70-74	n-Butanol	Me/nBu = 1/1	<0.5%

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.

Dyn. Viscosity 23°C (mPa*s)	Density 23°C (kg/m ³) approx.	Comments
1050-3000	1130	Designed for anodic electrocoat applications.
3000-6000	1130	Used in e-coat and high solids coatings.
750-1950	1080	Used in high solids coatings. Good film flexibility and recoat adhesion.
1400-3000	1080	Carboxy functionality. Excellent adhesion to metals.
1050-2000	1130	Excellent intercoat adhesion. Low VOCs.
2000-4500	1080	Methylated-isobutylated version of CYMEL 1133 resin. Excellent intercoat adhesion.
900-1800	1120	Designed for automotive coating formulations with improved appearance.
2500-7500	1090	Low MW resin. Good balance of reactivity, film flex properties and humidity resistance.
400-800	1040	Excellent flow and leveling, adhesion properties.

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

Butylated Melamine Resins

n-Butylated Melamine Resins

n-butylated resins in this category are very polymeric in nature. They differ in extent of methylation, butylation and polymerization. In general, higher extents of methylation 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.

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

Product name	Non volatile content 45min- 45°C (%)	Solvent	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa*s)
Highly n-Butylated Melamine Resins				
CYMEL 1156	96 (1)	-	<0.2%	3800-7500
CYMEL MB-94	94-97 (1)	n-Butanol	<0.1%	2400-3800
CYMEL MB-96	94-97 (1)	n-Butanol	<0.1%	1700-4500
CYMEL MB-98	96 (1)	n-Butanol	<0.1%	1700-4500
Partially n-Butylated Melamine Resins				
CYMEL 247-10	62-66 (3)	n-Butanol	<3.5%	-
CYMEL 651	58-62 (4)	n-Butanol / Xylene	<1.7%	1000-2000
CYMEL 658	53-57 (4)	n-Butanol / Xylene	<1.6%	350-550
CYMEL 1158	78-82 (1)	n-Butanol	<1.2%	3000-7000
CYMEL MB-14-B	68-72 (2)	n-Butanol	<2.5%	3800-5600
Partially iso-Butylated Melamine Resins				
CYMEL MI-12-I	58-62 (2)	iso-Butanol	<0.6%	1050-1950
CYMEL MI-97-IX	68-72 (2)	iso-But / Xylene	<0.6%	480-760

(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

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 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.

Density 23°C (kg/m³) approx.	Acid number (mg KOH/g)	Comments
1050	-	Good resistance properties when cured adequately. Very hydrophobic
-	-	Improves the water resistance of UF wood finishes. Very hydrophobic.
1000	-	
1040	0.25-1.0	Used for improved resistance properties in acid curing industrial wood applications.
-	1.0 max	Excellent compatibility, flow and leveling.
1010	0.8 max	Contains a non-silicone additive to promote flow and leveling.
1000	0.8 max	Recommended for primer applications.
1050	-	High solids. Fast cure response. Low HCHO release.
1060	0-1.5	For general industrial baking applications specially dipping applications.
970	0-1.6	For fast drying general industrial stoving applications, especially for primer formulations.
1010	1-3	Very fast curing. Good compatibility.

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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. None of these resins require the addition of a strong acid catalyst for acceptable cure response at 125°C.

The acidity of the other components in a formulation usually is sufficient for catalysis. 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

Product name	Non volatile content 45min- 45°C (%)	Solvent	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa*s)
Methylated Resins				
CYMEL U-65	96 minimum	Methanol	<0.5%	-
CYMEL UM-15	96 minimum	Methanol	<0.5%	6800-17000
Butylated Resins				
CYMEL U-80	96 minimum	n-Butanol	<0.3%	1700-4500

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.

Density 23°C (kg/m³) approx.	Water solubility	Xylene solubility	Comments
-	Complete	Partial	Good compatibility and cure response.
1200	Complete	Partial	Good compatibility and cure response.
1100	Insoluble	Complete	Very hydrophobic. Excellent water resistance properties when cured properly.

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

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 methylation, butylation, and polymerization. In general, higher extents of methylation 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

Product Name	Non Volatile %	Solvent	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa*s)
n-Butylated Urea Resins				
CYMEL U-21-511	58-62 (2)	n-But / Ethanol	<1.2%	-
CYMEL U-21-510	58-62 (2)	n-Butanol / Xylene	<1.0%	-
CYMEL U-216-8	57-61 (3)	n-Butanol / Xylene	<2.0%	-
CYMEL 216-10 LF	58-62 (3)	n-Butanol	<0.65%	S- V
CYMEL U-227-8	49-55 (3)	n-But / Xylene	<1.5%	1700-4500
CYMEL 1050	49-55 (3)	n-Butanol / Xylene	<0.8%	X - Z1
CYMEL U-1050-10	58-62 (3)	n-Butanol	<3.0%	-
CYMEL U-1052-8	54-58 (3)	n-But / Xylene	<1.5%	-
CYMEL U-1054	58-62 (3)	n-But / Ethanol	<1.0%	-
CYMEL U-610	65-69 (4)	n-But / Xylene	<1.8%	10000-13000
CYMEL U-640	58-62 (4)	n-But / Xylene	<1.0%	800-1400
CYMEL UB-24-BX	61-65 (5)	n-But / Xylene	<0.7%	1700-2600
CYMEL UB-26-BX	61-65 (5)	n-But / Xylene	<0.7%	1700-2600
CYMEL UB-90-BX	63-67 (5)	n-But / Xylene	<0.7%	700-1100
CYMEL UB-25-BE	61-65 (5)	n-But / Ethanol	<0.7%	1000-3000
CYMEL UB-30-B	63-67 (5)	n-Butanol	<0.6%	13000-25000
iso-Butylated Urea Resins				
CYMEL U-662	58-62 (4)	iso-But / Xylene	<0.3%	1200-2400
CYMEL U-663	60-64 (4)	iso-Butanol	<0.3%	2400-4500
CYMEL U-1051	58-62 (3)	iso-But / Xylene	<0.7%	-
CYMEL UI-19-I	61-64 (5)	iso-Butanol	<1.0%	8700-16000
CYMEL UI-19-IE	58-62 (5)	iso-Butanol / Ethanol	<1.0%	1700-3500
CYMEL UI-21-E	76-80 (5)	Ethanol	<0.5%	2500-4500
CYMEL UI-27-EI	58-62 (5)	Ethanol / iso-But	<0.7%	350-600
CYMEL U-38-I	67-71 (5)	iso-Butanol	<0.10%	12000-20000
CYMEL UI-20-E	76-80 (5)	Ethanol	<0.5%	1700 - 3500

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 methylation, 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.

Density 23°C (kg/m ³) approx.	Acid number (mg KOH/g)	Comments
1030	2-5	Exempt solvent version of CYMEL U-21-510 resin.
1030	2-5	
1040	0.5-2.0	
1010	-	Low free formaldehyde for metal deco, can and coil coating primers.
1000	1-4	General purpose butylated urea formaldehyde resin.
1000	-	For fast cure industrial bake and low temperature cure wood conversion varnishes.
1010	1-4	CYMEL U-1050 resin supplied in n-butanol.
1040	2-2.7	Fast-curing, compatible resin. Suitable for epoxy systems.
1050	5-7	Fast-curing, compatible resin. Suitable for epoxy systems.
1050	2-3	For general industrial baking applications especially for metal decorating primer formulations.
1025	2-4	For general stoving primer formulations with excellent flow and levelling properties.
1020	2-5	For general industrial stoving finishes when electrostatic spray application is required.
1020	2-5	For general industrial stoving finishes and primer formulations.
1040	0.5-3	For general industrial stoving formulations special for electrostatic spray applications.
1020	1.5-3.5	Fast-curing resin for wood finishes and general metals.
1030	1-3	Fast-curing resin for wood finishes and general metals.
1010	0.75-1.5	Medium-high reactivity. Recommended for wood finishes. Low HCHO emission.
1000	0.75-1.5	Medium-high reactivity. Recommended for wood finishes. Low HCHO emission.
1010	2-10	Fast cure and excellent compatibility.
1020	0.5-2	Fast curing resin for wood finishes. Low formaldehyde emission.
1000	0.5-2	For fast drying acid curing wood coating formulations with low odor requirements.
1010	0-1	Good cure speed. General purpose resin.
1010	1-3	Good cure speed. Compatible with nitrocellulose systems.
1030	2-4	Used in primers and topcoats for metal substrates. High resistivity.
1010	0-1	High film build wood coatings.

Benzoguanamine and Glycoluril Resins

Benzoguanamine 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.

Product Name	Non Volatile %	Solvent	Alkoxy Ratio Approx.	Free Formaldehyde (%)	Dyn. Viscosity 23°C (mPa*s)
Benzoguanamine Resins					
CYMEL 659	70 - 74 (1)	Butanol	n-Butyl	<1.3%	650 - 1200
CYMEL 1123	98 minimum (2)	-	Me/Eth = 55/45	<0.2%	3800-10200
CYMEL 1125	87-91 (2)	2-butoxy ethanol	Me/Eth = 55/46	<0.2%	5000-17000
CYMEL 5010	64-68 (3)	n-But / Xylene	n-Butyl	<1.0%	-
Glycoluril Resins					
CYMEL 1170	98 minimum (2)	n-Butanol	n-Butyl	<0.5%	3000-6000
CYMEL 1172	43-47 (3)	Water	Unalkylated	<1.5%	<50

(1) = Pan solids 120' at 120°C

(2) = Foil solids 45' at 45°C

(3) = Pan solids 120' at 105°C

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.

Density 23°C (kg/m ³) Approx.	Water Solubility	Xylene Solubility	Comments
1065	Insoluble	Complete	Excellent adhesion and corrosion resistance for direct to metal coatings.
1170	Insoluble	Complete	For high quality industrial primer formulations which provide excellent film flexibility and adhesion.
1140	Insoluble	Partial	For electrodeposition and primer formulations requiring very good adhesion, and resistance properties.
1050	Insoluble	Complete	Polymeric general purpose resin.
1070	Insoluble	Complete	Highly butylated, highly monomeric resin. Very hydrophobic. Excellent film flex.
1210	Complete	Insoluble	Unalkylated resin for WB finishes. Fast curing.

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

Formaldehyde Free Resins

CYMEL® NF 2000

CYMEL NF 2000 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 2000 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 isocyanates - in order to obtain a balance of properties. CYMEL NF 2000 is recommended for high quality durable finishes such as automotive topcoats, exterior can varnishes and coil coatings. CYMEL NF 2000 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 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/

Product Name	Non volatile content 45min- 45°C (%)	Solvent	Dyn. Viscosity 23°C (mPa*s)	Density 23°C (kg/m ³) approx.
CYMEL NF 3041	62-66 (1)	Butanol	300-1000	1000
CYMEL NF 2000	48-52 (2)	Butanol	10-50	950
CYMEL NF 3030	40-45 (3)	Water	< 300	1170

(1) = Foil solids 45' at 45°C

(2) = Pan solids 120' at 105°C

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.

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.

Water Solubility	Xylene Solubility	Comments
Insoluble	Complete	Formaldehyde free, industrial wood coatings.
Insoluble	Complete	Formaldehyde free, high performance, heat cured coatings.
Soluble	Insoluble	Formaldehyde free, industrial wood coatings, no VOC.

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 and urea-formaldehyde resins used primarily for bake enamel and conversion varnish applications.

Product Name	Non Volatile by Weight (%)	Solvent	Free Formaldehyde (%)	Dynamic Viscosity 23°C (mPa-s)
Butylated Melamine-Formaldehyde Resins				
SETAMINE US-138 BB-70	69 - 73	n-Butanol	~0.4%	1100-1700
SETAMINE US-146 BB-72	70 - 74	n-Butanol	~0.3	1500-4500
SETAMINE US-148 BB-70	68 - 72	n-Butanol	~0.4	700-1500
SETAMINE US-132 BB-71	69 - 73	n-Butanol	~0.6%	700-1100
SETAMINE US-146 BX-65	65 - 67	n-Butanol / Xylene	~0.3	600-1200
SETAMINE US-144 BB-60	58 - 62	n-Butanol	~0.2%	500-1000

Product name	Non Volatile by Weight (%)	Solvent	Free Formaldehyde (%)	Viscosity 77°F (Gardner_Holdt)
Butylated Urea-Formaldehyde Resins				
SETAMINE 19-1001	48 - 52	n-Butanol / Xylene	≤ 0.8%	V - Y
SETAMINE 19-1020	50 - 54	iso-Butanol / Xylene	≤ 0.7%	Y - Z1
SETAMINE 19-1012	48 - 52	iso-Butanol / Toluene	≤ 1.5%	E - G
SETAMINE 19-1005	48 - 52	n-Butanol	≤ 0.75%	J - N

	Density 23°C (kg/m ³)	Acid Value (mg KOH/g)	Comments
	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.
	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.
	1,03	0.3 max	Very good compatibility, high reactivity with low viscosity, excellent sprayability, good petrol and acid resistance, high gloss, excellent second coat adhesion. Used in automotive top coats in combination with alkyd, polyester, or thermosetting acrylic resins.
	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.
	1,02	0.7 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.
	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.

	Density 23°C (lbs/gal)	Acid Value (mg KOH/g)	Comments
	8,50	2 max	Used for bake enamels, primers and conversion varnishes.
	8,45	2 max	Isobutylated urea resin used for bake enamels, primers and conversion varnishes; greater film hardness and quicker cure vs. n-butylateds.
	8,30	2 max	Used for bake enamels, primers and conversion varnishes; greater film hardness and quicker cure vs. n-butylateds.
	8,30	2 max	Used for bake enamels, primers and conversion varnishes; supplied in non-HAP containing solvent blend.

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