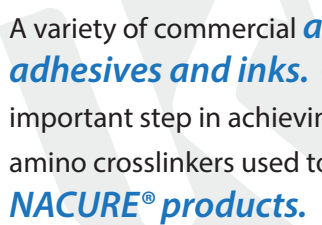


NACURE®

Catalyst Selection Guide
For Amino Crosslinked Coatings



A variety of commercial *amino resin crosslinkers* are available today for use in *thermoset coatings, adhesives and inks*. Crosslinkers are selected based on end use applications. Proper *catalyst selection* is an important step in achieving final *performance requirements*. This catalyst selection guide addresses the variety of amino crosslinkers used today and the type of catalyst best suited for them, as well as the *benefits of using specific NACURE® products*.

NACURE® catalysts and the amino crosslinkers are best selected after the end use application and performance criteria have been determined. Clear definition of the end use will allow for easier crosslinker selection and proper catalyst selection, which will ultimately create specific performance results.

Common Amino Resin Crosslinkers*

Fully Methylated High Solids (HS)	Fully Alkylated Mixed Ether (HS)	Highly Butylated Low-Med Solids	Highly Methylated High Imino	Partially Methylated Polymeric
Resimene ¹ 745, 747 Cymel ² 301, 303LF Luwipal ³ 066 Melcross ⁴ 03 CCP ⁵ MR-603	Resimene 751, 755 Cymel 1116, 1133 Luwipal 052 Melcross 11 CCP MR-2133	Resimene 881, 891 Cymel 1156 Luwipal 044 Melcross 22 Setamine ⁶ 19	Resimene 717, 718 Cymel 323, 325, 327 Luwipal 072, 073 Melcross 27 CCP MR-625	Resimene 730, 741 Cymel 370, 373 Luwipal 069

*Trade name reference table is located on the back cover.

Table 1 - Amino Crosslinker Selection*

	Amino Crosslinker Type	Attributes
Use Strong Acid Catalyst	Fully Methylated (HMMM)	Crosslinking agents for hydroxyl, carboxyl and amide functional polymers. Advantages include low VOCs, high film flexibility and toughness, good stability, mar resistance and intercoat adhesion. Excellent exterior durability and good heat resistance.
	Fully Alkylated	Longer chain length alkoxy sites impart lower viscosity, improved flow and leveling and intercoat adhesion properties.
	Highly Butylated	Butoxy sites impart improved flow and leveling and intercoat adhesion properties. Other advantages include high film flexibility and toughness when used with inherently flexible backbone resins, excellent stability and good mar resistance.
	Benzoguanamines	Noted for their enhanced film flexibility, toughness, chemical resistance and detergent resistance.
	Urea Formaldehyde	Noted for their fast cure, high strength and cost effectiveness.
	Glycolurils	Noted for their film toughness and flexibility, adhesion to metals and good UV resistance.
Use Weak Acid Catalyst	Highly Methylated	Advantages include fast cure response, high film hardness and low formaldehyde release on cure. Generally less flexible coatings and higher VOCs are experienced when used in solvent-based systems.
	Partially Methylated	Film performance similar to high imino resins above, however their major limiting factor is high formaldehyde release on baking, primarily due to their high free methylol content.
	Phenolic	Noted for their chemical resistance and commonly used for can coatings and drum linings.

*This information is a general guide and not intended to be used as a formulating tool.
*Always consult your resin supplier before selection.

NACURE® Catalyst Selection

Acid Strength - A general recommendation for matching the strength of the acid to the resin crosslinker can be found on the tabs in *Table 1* on the previous page. In general, strong acid catalysts are needed for fully methylated, fully alkylated and highly butylated amino resin crosslinkers.

Hydrophilic Catalysts - Benefits include faster and lower temperature curing in systems crosslinked with the more monomeric melamines like HMMM. They are typically water soluble and are well suited for waterborne applications.

Hydrophobic Catalysts - Benefits include good water and salt spray resistance properties. They are soluble in a wide range of solvents, including non-polar aromatic and aliphatic solvents.

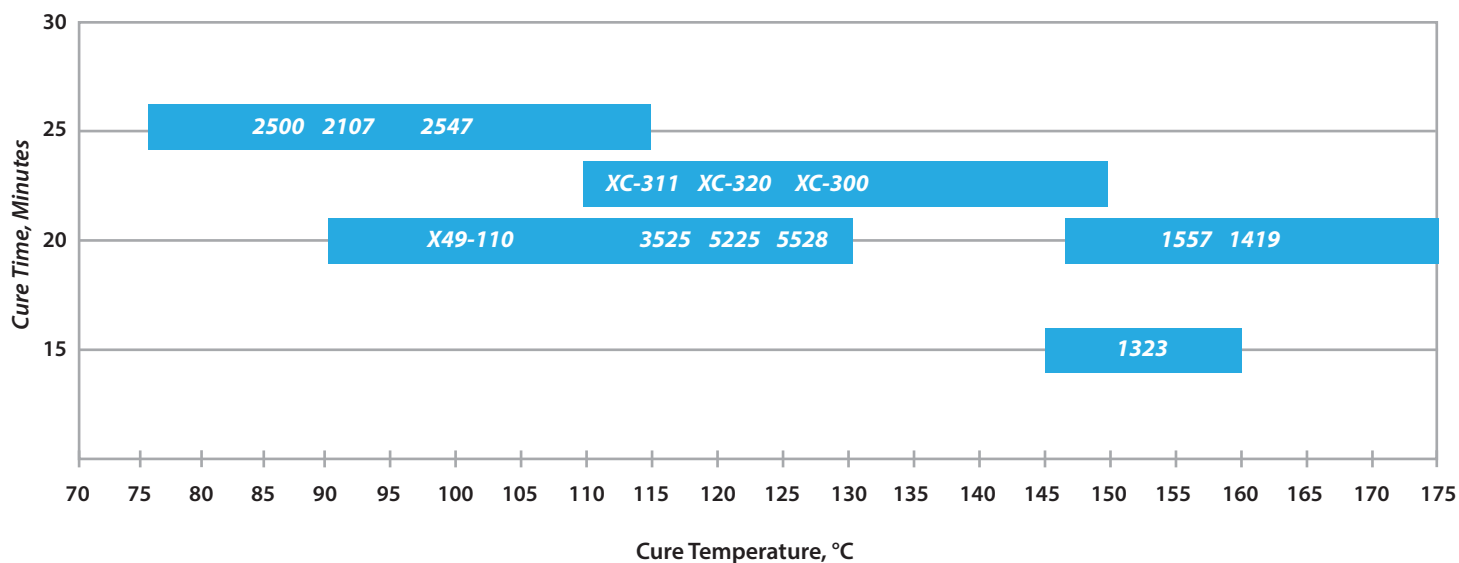
NACURE Hydrophobicity by Acid Type*			
	<i>p-TSA</i>	<i>DDBSA</i>	<i>DNNSA</i>
Hydrophilic ←	2500	5225	155
	2547	5528	3525
		5076	X49-110
			<i>DNNSA</i>
			1051
			1323
			1419
			Hydrophobic →

*King also offers phosphates

NACURE Catalysts Cure Profiles

NACURE catalysts come in a wide variety of acid and blocked acid catalysts as seen in *Table 4* on *Page 5*. A blocked acid catalyst may be preferred depending on the system's storage stability requirements. Refer to *Table 2* for typical NACURE cure profiles.

Table 2 - NACURE Blocked Acid Cure Profiles



NACURE catalysts are best selected after the end use application and performance criteria has been determined. Clear definition of the end use will allow for easier crosslinker selection and proper catalyst selection, which will ultimately create specific performance results. Table 3 below is a selection tool to help pair the correct catalyst to the crosslinker. In addition, King also offers catalysts for benzoguanamine and phenolic crosslinkers.

Table 3 - Catalyst Selection

NACURE Selection

Amino Crosslinker Type	Trademarks*	Applications**	Best NACURE	
Fully Methylated <i>High Solids (HS)</i>	Resimene 745	Coil Top Coat	1051, 1323, XC-311	Strong Acid Catalysts
	Resimene 747	Coil Primer	1051, 1419, XC-300	
	Cymel 301	Can Exterior	155, 3525	
	Cymel 303LF	Can Interior	5925	
	Luwipal 066	General Industrial	155, 3525, 2500	
	Melcross 03	Appliance	3525, 1953	
	CCP MR-603			
Fully Alkylated <i>Mixed Ether (HS)</i>	Resimene 751, 755	Coil Top Coat	1051, 1323, XC-311	Strong Acid Catalysts
	Cymel 1116, 1133	Coil Primer	1051, 1419, XC-300	
	Luwipal 052	Auto Top Coat	5076, 5225, 2500	
	Melcross 11	Auto Base Coat	155, 3525, 2500, XC-320	
	CCP MR-2133	Auto Primer	155, 3525	
Highly Butylated <i>Low-Med Solids</i>	Resimene 881, 891	Metal Decoration	155, 3525	Weak Acid Catalysts
	Cymel 1156	Auto Topcoat	5076, 5225, 2500	
	Luwipal 044	Wood	155	
	Melcross 22	Plastic	155, X49-110	
	Setamine 19			
Highly Methylated <i>High Imino</i>	Resimene 717	Auto Base	XC-235, 4575	Weak Acid Catalysts
	Resimene 718	General Industrial	4054, 4167	
	Cymel 325	Wood	XC-235, 4000	
	Cymel 327	Plastic	4000	
	Luwipal 072	Paper	4000	
	Luwipal 073			
	Melcross 27			
CCP MR-625				
Partially Methylated <i>Polymeric</i>	Resimene 730	General Industrial	4054, 4167	Weak Acid Catalysts
	Resimene 741	Wood	XC-235, 4000	
	Cymel 370	Plastic	4000	
	Cymel 373	Paper	4000	
	Luwipal 069			










*The registered trademarks above are listed on the back cover of this brochure.

**The applications listed in the table above are those commonly associated with the crosslinker type in the previous column.

Table 4 - NACURE® Product Recommendations

NACURE				Auto	Can	Coil	Wood	Paper	Industrial
Product	% Active	Min. Cure	Attributes / Uses						
DNNSA	155	55%	RT	General purpose catalyst. Excellent adhesion. Excellent water, detergent and salt spray resistance.	W, P, R	E			P, TC
	3525	25%	120°C	Blocked. Excellent solubility, good salt spray resistance and adhesion properties.	W, P, BC	MC	P, MC		P, TC
	X49-110	25%	90°C	Blocked. Best overall properties of the DNNSA catalysts with excellent corrosion resistance and adhesion.	W, P, BC	MC			TC
p-TSA	2107	25%	90°C	Blocked. Ideal for textured coatings. Good metal mark resistance.			BC, MC		TC
	2500	25%	80°C	Blocked. Low temperature cure with excellent stability. Excellent color.	BC	E	BC, MC		TC
DNNSA	1051	50%	RT	Best water and corrosion resistance. Good overbake and telegraph resistance. For high temperature applications.			P, MC		P
	1323	21%	150°C	Blocked. For high temperature applications. Excellent solubility. Good package stability.			P, MC		
	1419	30%	150°C	Blocked. For high bake applications with good salt spray, detergent and boiling water resistance. Excellent adhesion.			P		
	1557	25%	150°C	Resolves solvent popping in thick films. Excellent humidity and detergent resistance.		E	P		P
DDBSA	5076	70%	RT	Complies with FDA 21 CFR Sec. 175.300 (b) (3) xii & xiii (a&b) and EC directive 10/2011. Fast cure		I, E			
	5225	25%	120°C	Blocked. Best solubility in high solids enamels with good performance in aliphatic solvents.	W, BC, CC, R		TC		
	5528	25%	120°C	Blocked. Broad solubility and excellent color stability.	W, BC, CC, R	TC			
	5925	25%	120°C	Blocked. Complies with FDA 21 CFR Sec. 175.300 (b) (3) xii & xiii (a&b)		I, E			
PHOSPHATE	4000	100%	80°C	A weak acid catalyst with broad solubility, good package stability and adhesion.			MC	MC	
	4054	50%	80°C	A weak acid catalyst with excellent solubility and water resistance compared to other phosphates.			MC	MC	P, TC
	4167	25%	80°C	Blocked. Neutralized weak acid catalyst with good solubility, water resistance and excellent stability.	CC		MC	MC	P, TC
	4575	25%	100°C	Blocked. Amine neutralized catalyst with high gloss and superb storage stability with polymeric amino resins.			MC	MC	

NEW NACURE

NEW PRODUCTS	Product	% Active	Min. Cure	Attributes / Uses	Auto	Can	Coil	Wood	Paper	Industrial
	XC-296B	28%	200°C	An acid catalyst designed for use in solventborne epoxy-free can coatings based on polyester/phenolic resin systems.		 E, I	 MC			
XC-300	25%	150°C	Provides long storage stability for consistent cure response needed with basic pH anti-corrosive pigments.			 P			 P	
XC-311	50%	110°C	Novel catalyst designed to reduce the cure temperature of amino crosslinked systems.	 BC		 BC, MC			 P, TC	
XC-320	50%	110°C	Formulated for water based systems to reduce cure temperature of amino crosslinked systems.	 BC		 P				

R = Repair P = Primer BC = Basecoat CC = Clearcoat I = Interior
 W = Waterborne MC = Monocoat TC = Topcoat E = Exterior

Choosing the correct **catalyst** will optimize a coating in several ways, including enhanced **cure speed**, improved **long term stability** and **film performance**. A wide variety of **strong and weak acid catalysts** are available from King Industries. We encourage our customers to work with our highly experienced technical service team to select the proper **catalyst** for their demanding **coatings application**.



Notes:

Amino Crosslinker Tradenames

1. Resimene	INEOS
2. Cymel	ALLNEX
3. Luwipal	BASF
4. Melcross	P&ID Co.
5. CCP MR	CCP
6. Setamine	Nuplex

Contact Information

www.kingindustries.com

Global Headquarters Tech. Service, R&D, and Sales

King Industries, Inc.
1 Science Rd.
Norwalk, CT 06852, USA
Phone: 1-203-866-5551

European Tech. Sales Office

King Industries, International
Science Park 402
1098 XH Amsterdam
The Netherlands
Phone: 31 20 723 1970

Asia-Pacific Tech. Sales Office

Synlico Tech Co., Ltd.
42 Ju Lin Ya Yuan
Richmond Hill (Juhaoyuan)
Zhongshan, China
Phone: 86 760 88229866



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