

# ***Epoxy Curing Agents***

*Diluents*

*Accelerators*

*Adhesion Promoters*

*Speciality Resins*

*Europe, Middle East & Africa*

# Air Products

## About us

From humble beginnings, over the past 68 years our company has grown by really understanding what our customers want from performance chemicals and industrial gases.

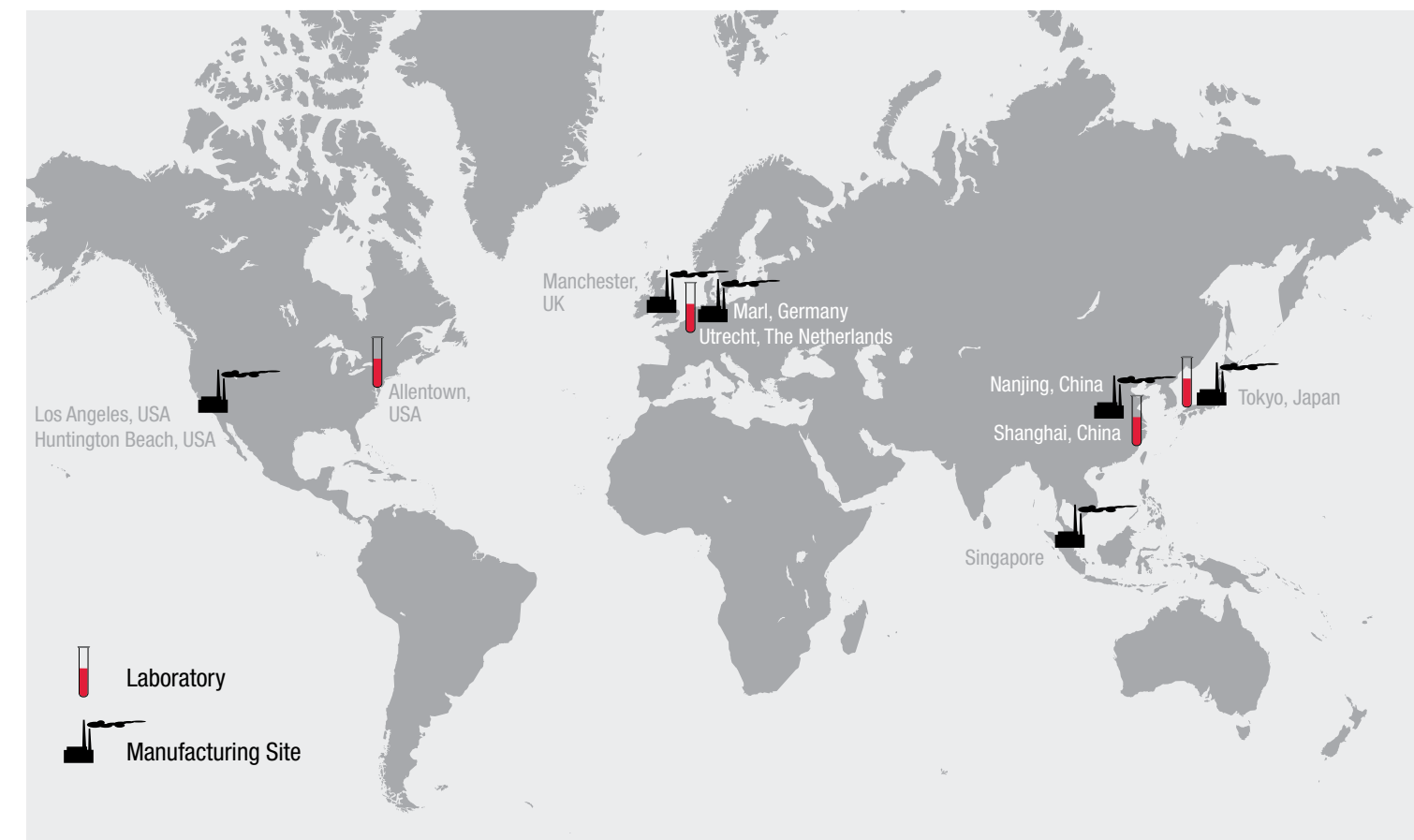
Today we're a \$10.0 billion company and the same principles apply. With ~21,000 employees, and locations in more than 40 countries, we are recognised worldwide for our innovative culture, operational excellence and commitment to safety and the environment.



## Epoxy Additives

Since the late 1980s Air Products has firmly established itself as a major international supplier of epoxy curing agents and modifiers. Now part of the Performance Materials Division, we supply products into concrete coatings, metal coatings, adhesive and composite applications all around the globe.

From our ability to utilise unique new building blocks to formulate novel curing agents and our fundamental understanding of epoxy chemistry, our know-how can really help your business thrive.



With manufacturing sites and laboratories spanning the globe, we are well positioned to serve your needs, now and in the future.



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# Concrete Protection

To protect concrete surfaces, an epoxy coating will offer the best in terms of chemical and mechanical resistance, ensuring that your floors last for many years to come.

		Anquamine 721	Anquamine 731	Anquawhite 100	Anquamine 287	Epilink 701	Ancamine 2685	Ancamine 2686	Ancamine 2280	Ancamine 2672	Ancamine 2519	Ancamine 155	Ancamide 2386
Primers	Standard	●				○		●					
	Primer for application onto damp concrete	●			○	○							●
	Concrete Reinforcement				●								
	Adhesion onto poorly prepared surfaces	●			●								○
Concrete Paint	Standard	●				○					●		
	Chemical Resistance			○				○	●	●	○		
	UV Resistance			●			●						
	Best Economics	●						●					
	Carbamation Resistance	●		●		●	●		○		○	●	
Self levelling floor	Standard		○			●					○		
	Chemical Resistance								○	○	●		
	UV Resistance		●				○						
	Best Economics		○					○					
	Carbamation Resistance		○			○			●		●	○	
	Water Vapour Permeable		○			○							
	Low Emissions		○			●							
Screeds / Mortars	Standard		○			●		●			○		
	Chemical Resistance								○	○			
Other flooring systems	Thermal Shock Flooring				○								
	Transparent Sealer			○			○						
	Conductive Flooring	○	○			●						○	

○ Primary recommendation   ● Alternative recommendation



# Metal Protection

Epoxy systems are commonly used in both marine and industrial maintenance applications, as the first choice for protecting metal surfaces against corrosion, due to their excellent barrier and adhesion properties.

		Ancamide 221X70	Ancamide 261A	Ancamide 351A	Ancamide 702B75	Ancamide 2652	Ancamide 2445	Ancamide 2050	Ancamide 2573	Anquamine 419 & Ancarez AP555	Ancamide 2353	Ancamide 2443	Ancamide 2634
Primers	Conventional Primer	●	○										●
	Surface Tolerant Primer								●		●	●	
	Extended Overcoat Window					●							
	Low Temperature Cure						●		●		○		
	Low VOC / High Solids			○		○	○*	●*	○*	●	○*	●	
	No Induction Time				●	○	●	○		●	●		●
	Cathodic Disbondment												●
Paints	Standard Paint	○	○	○			○	●					
	Chemical Resistance										●		○
	Low Temperature Cure						●		○		○		●
	Low VOC / High Solids						●*	○*	●*	○	●*		
	No Induction Time				○		○	●		○	○		○
	UV Resistance	●	●	●				●		●			


\* Contains Benzyl Alcohol

○ Primary recommendation    ● Alternative recommendation

# Composites and Adhesives

With the increasing need for lightweight, strong and chemical resistant systems within the composite sector, epoxies are finding a wide applicability in the wind energy, pipe, aerospace, automotive and general industrial markets. Epoxies exhibit versatility in fabrication methods including infusion, wet lay up, filament winding and pre-preg.

Epoxies can be formulated into both 1k (heat cure) and 2k (ambient post curable) adhesives for a wide variety of end applications, including automotive, aerospace and general industrial adhesives. The high adhesion, strength, and toughness coupled with low shrinkage and formulation versatility make epoxies your perfect choice.

			1k							2k							
			Amicure CG1200G / Dicyanex 1400B														
			Ancamine 2014AS	Ancamine 2014FG	Ancamine 2337S *	Ancamine 2442	Amicure UR 7/10	Amicure UR2T	Curezol 2MZ Azine-S	Amicure PACM	Ancamine 2167/2264	Ancamine 1922A	Ancamine 2422	Ancamide 506	Ancamine 1769	Ancamide 910	Ancamide 261A
Composites	Pre-preg	Low Onset Temperature		○	●	○											
		Low Cure Temperature			●												
		Short Cure Schedule		●	●	●											
		Latency	●			●	○	○	○								
		High Tg					●	●	○								
	Ambient cure	Low Viscosity							○		○				●		
		Pot Life							●	●			○				
		Short Cure Schedule												○			
		High Tg							○	○		○		○			
		Fracture Toughness							○	○	○						
Adhesives	Post cure	Low Onset Temperature		○	●	○											
		Low Cure Temperature			●												
		Ultimate Bond Strength				●		●	●								
		Green Strength Development			●		●	●									
		Short Cure Schedule	●	●	●	●											
		Latency	●			●	○	○	●								
		High Tg					●	●	●								
	Ambient cure	Low Viscosity							○		○				○		
		Pot Life							●	●			○				●
		High Tg							●	●							
		Bond Strength									○					○	●
		Temperature Resistance									○					○	
		Peel strength														○	○
		Economics															○

\* Ancamine 2337S is not a dicyandiamide accelerator, however it can be used in a dicyandiamide containing system as a co-curable to provide green strength.

○

 Primary recommendation

●

 Alternative recommendation



General Performance

Waterborne Curing Agents

Comparison Summary

Selection Summary

Colour and Colour Stability	Viscosity	Pot-Life	Low Temperature Cure	Surface Film Appearance	Film Flexibility	Adhesion	Chemical Resistance	
							Acids	Solvents
Excellent	Low	Long	Good	Gloss	Excellent	Excellent	Excellent	Very good
Waterborne - D	Waterborne - D	Waterborne - D	Aliphatic-MB	Waterborne - D	Waterborne - D	Waterborne - S	Cyclo-aliphatic-A	Aliphatic-A
Cyclo-aliphatic-A	Cyclo-aliphatic-A	Amidoamine		Cyclo-aliphatic-MB	Polyamide	Polyamide		Aliphatic-MB
Waterborne - S	Cyclo-aliphatic-MB			Cyclo-aliphatic-A	Waterborne - D	Waterborne - D	Cyclo-aliphatic-MB	
Aliphatic-A		Polyamide			Amidoamine	Amidoamine	Aliphatic-MB	Cyclo-aliphatic-A
Cyclo-aliphatic-MB	Amidoamine	Waterborne - S	Waterborne - D	Aliphatic-MB	Waterborne - S		Aliphatic-A	Cyclo-aliphatic-MB
Aliphatic-MB	Aliphatic-A	Cyclo-aliphatic-A	Aliphatic-A	Polyamide	Cyclo-aliphatic-A	Aliphatic-MB	Waterborne - D	Waterborne - D
Amidoamine	Waterborne - S	Aliphatic-MB	Polyamide	Amidoamine	Aliphatic-A	Cyclo-aliphatic-A	Waterborne - S	Polyamide
Polyamide	Polyamide		Aliphatic-MB	Aliphatic-A	Aliphatic-MB	Aliphatic-A	Amidoamine	Amidoamine
			Amidoamine				Polyamide	

Working examples used for above simplistic comparison:

Polyamide	Ancamide 351A
Amidoamine	Ancamide 506
Cycloaliphatic-A	Ancamine 2519
Waterborne-S	Anquamine 721

Waterborne-D	Anquawhite 100
Cycloaliphatic-MB	Ancamine 2072
Aliphatic-A	Ancamine 1608
Aliphatic-MB	Ancamine 2432

Key  
A Adduct-type      S Solution  
MB Mannich-base type      D Dispersion

		Liquid Epoxy Resin							Solid Epoxy Resin Dispersion**		
		Eplink 701	Eplink 360	Anquamine 401	Anquawhite 100	Anquamine 287	Anquamine 721	Anquamine 731	Anquamine 401	Anquawhite 100	Anquamine 419
PRIMER	Standard Primer	●	●	●			○		●		
	Concrete Reinforcement					○					
100-500 µm	Standard Concrete Paint	●			●		●		●	●	
	Transparent Sealer*				●					●	
	Institutional*				●					●	
1-5 mm	Self Levelling	○						●			
	Tile Grout/Adhesive	●		●				●	●		
	Epoxy Modified Cement (or ECC)			●							
	Thermal shock flooring					●					
METAL	OEM Primer	○							○		●
	PC/Marine	○									●

\* Alternative recommendations are Acrylic PUD's (Please see page 44).  
\*\* Ancarez AR555

● Primary recommendation      ○ Alternative recommendation

Principal properties

- Zero VOC achievable
- Easy clean-up
- Good adhesion especially to damp concrete

Principal applications

- Protective and industrial concrete coatings
- Expanding use into self-levelling and mortar floors and tile grouts
- Steel coatings with liquid resin and higher molecular weight resin emulsions. Anti-corrosive primers for OEM and light duty applications.

# Waterborne Curing Agents

## Comparison Summary

Colour Stability	Viscosity (Pa.s @ 25°C)	Cure rate at low temperature (thumb twist)	Pot-Life <sup>§</sup>	Film Flexibility	Chemical Resistance	
					Aqueous acids	Solvents
Excellent	Lowest	Excellent	Longest	Excellent	Good	Good
100	100	287	100	100	100	100
721	287	731	721	419	287	287
731	701	731	419	360	701	401
401	419	100	701	721	731	419
419	419	401	401	401	419	731
701	401	701	701	401	721	701
	721				401	721
	731	721	401	701	360	
	360	419	287	731		
	360			287		360
360		360	360			
287						
Moderate	Highest	Poor	Shortest	Good	Poor	Poor

§ Resin dependent - with Anquamine 401, for example, solid and semi-solid resin emulsions can give pot lives in excess of 5 hours.

## Anquawhite 100

Anquawhite 100 is the only waterborne epoxy curing agent that dries to a completely clear finish at any thickness in coating systems and maintains colour stability. It is ideal for industrial concrete coatings, top finishing coatings, stone flooring, parquet floors and lacquers. In fact, any surface, anywhere.

Quick and simple to use, with high solids and low viscosity, it pours easily, dries quickly and builds a coat from fewer, thicker layers.

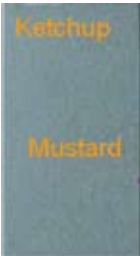
Being waterborne, Anquawhite 100 is VOC compliant, but also offers excellent chemical resistance against stains and acids.

Anquawhite 100 curative... Another performance advantage developed from our unique understanding of material science and surface chemistry.



\* Picture illustrates the transparency that can be achieved by systems based on Anquawhite 100.

Anquawhite 100



Conventional water borne



\* Picture illustrates the enhanced stain resistance offered by Anquawhite 100 compared to a traditional waterborne curing agent.

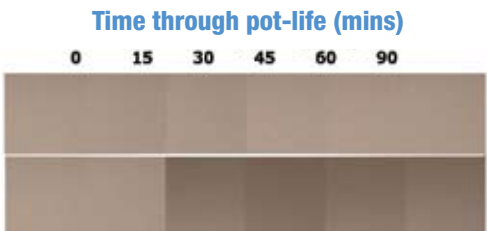
## Anquamine 721

- High aesthetics
- Excellent pigment acceptance
- Good pigment paste compatibility
- Minimal colour drift during pot life

Anquamine 721 is the first choice curing agent for direct to concrete applications; It has been designed specifically for cost effective, high performance concrete primer and concrete paint applications. The adhesive strength of Anquamine 721 based primer systems provide superior adhesion compared to both solvent-free and solventborne technologies particularly onto damp concrete where the adhesive strength is greater than the tensile strength of the concrete itself.

High performance pigmented coatings are also possible with Anquamine 721, which exhibit excellent pigment wetting and acceptance of pigment pastes including those used in

universal aqueous tinting systems, which allows for a varied colour pallet of high gloss, highly protective coatings to be offered.



\* Picture illustrates that whereas the colour can drift during pot life for many typical water borne paints, paints based on Anquamine 721 offer much improved colour stability throughout application.



# Waterborne Curing Agents

Curing Agent	Generic Type	UV Resistance	Chemical Resistance	Fast Cure	Economics	Carbanation Resistance	Pot Life	Flexibility	Low Viscosity	Anti-corrosive System	Colour (Gardner)	Viscosity (Pa.s @ 25C)	Amine Value (mg KOH/g)	Specific Gravity (@ 25C)	Flash Point (°C)	AHEW	Loading (PHR)	Solids (%)	Pot Life (Hours)	Typical Cure Schedule (Days)	Comments / Applications	Labelling	R&S Phrases
Anquamine 721	Aqueous solution of modified amine adduct				●	●		●			5	30	150-190	1.08	-	300	140-170	48-52	2-3	2-7	Anquamine 721 has been specifically developed for cost effective concrete floor coatings at up to 300 micron applied film thickness. Anquamine 721 easily emulsifies standard liquid epoxy resins, offers excellent adhesion to damp concrete and has universal pigment acceptance.	Xi	R36/37/38, S26
Anquamine 731	Aqueous solution of modified amine adduct				●	●					5	30	175	1.08	-	200	100-120	53-57	1	2-7	Anquamine 731 is ideal for cost effective high film build concrete coatings, particularly self levelling systems of 1-3 mm film thickness. It boasts rapid hardness development and good UV resistance.	C	34, R43, S26, S36/37/39, S45
Anquawhite 100	Aqueous dispersion of modified amine adduct	●	●			●	●		●		Dispersion	0.2	100	1.05	-	350	180	53-57	6	2-7	Anquawhite 100 uniquely offers both fast dry times and a long pot life (6-8 hours) when used in conjunction with a standard liquid epoxy resin. It's superb UV resistance makes this curing agent ideal for white / clear top coats where aesthetics are key.	Xi	R36, R38, S26, S37/39
Anquamine 287	Aqueous solution of modified amine adduct			●		●			●		12	1	155-175	1.08	-	240	125	48-50	1	2-7	Anquamine 287 has successfully been used as both a concrete reinforcing primer and in an epoxy cementitious system that offers good thermal shock and chemical resistance.	Xn	R41, R22, S26, S39
Epilink 701	Aqueous emulsion of modified amine adduct			●		●				●	Emulsion	5-10	130-165	1.08	-	300	140-170	53-57	2-4	2-7	Epilink 701 is a versatile curing agent which has a long track record of successful applications in a number of different end uses. It is a unique polymeric emulsion and as a result provides excellent performance and advantages over other waterborne curing agents in a wide range of applications.	Xi	R41, S25, S26, S39
Anquamine 419	Aqueous solution of modified amine adduct					●	●	●		●	8	8-14	150-190	1.08	50	284	20-32*	59-61	4-6	2-14	When used in conjunction with a solid epoxy resin dispersion such as Ancarez AR555, Anquamine 419 based systems give fast dry times, excellent corrosion and humidity resistance making them ideal for VOC compliant industrial maintenance, marine, OEM and other metal primer / topcoats.	Xi	R10, R36/38, S26, S37
Anquamine 401	Aqueous solution of modified amine adduct			●		●				●	12	25-40	240-260	1.09	-	166	60-90	69-71	1-1.5	2-7	A high solids, rapid curing hardener that can be used with both liquid epoxy resin and solid epoxy resin dispersions for concrete / metal coatings and primers. Systems based on Anquamine 401 are also ideal for ECC (epoxy cement concrete).	Xi	R38, R41, R43, R52/53, S24, S26, S37/39, S61
Epilink 360	Aqueous solution of modified polyamide				●	●					16	30-50	150-190	1.05	-	240	100-150	49-51	1	7-14	Epilink 360 has become an industrial standard for economical water based primers, with moderate dry speeds.	Xi	R38, R41, R52/53, S26, S39, S61

\* Loading (PHR) for Anquamine 419 has been calculated when used in combination with a solid epoxy resin dispersion such as Ancarez AR555.

# Aliphatic Curing Agents

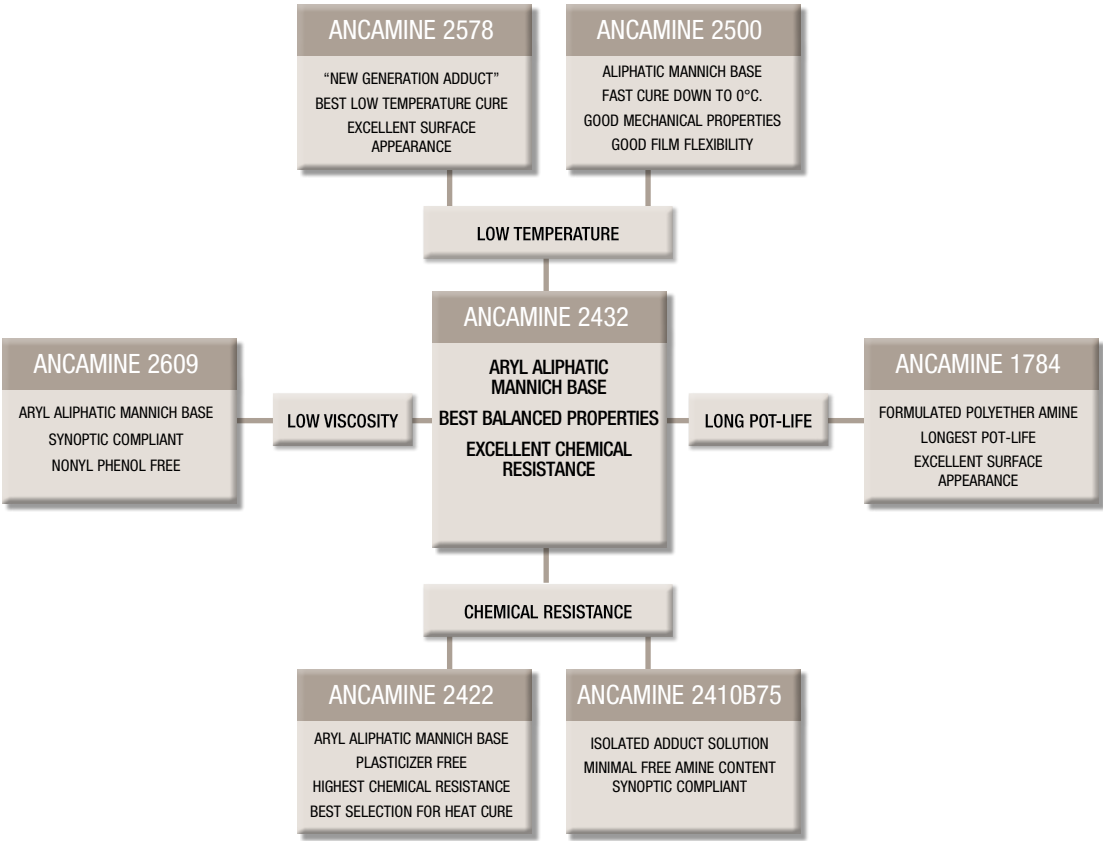
Focused Product Selection

## Principal properties

- Fast cure at ambient and subambient temperatures
- High reactivity
- Excellent chemical resistance

## Principal applications

- Accelerators for other amine curing agents
- Civil engineering e.g. flooring and patch repair systems
- High solids coatings e.g. heavy duty and OEM



Initial Colour (Gardner)	Colour Stability	Usage Rate (PHR)	Viscosity (mPa.s @ 25)	Pot-Life (mins)	Cure Rate at Low Temperature	Chemical Resistance	
						Aqueous acids	Solvents
Low	Excellent	Lowest	Lowest	Longest	Excellent	Very Good	Very Good
1784	1784	15		1784	2578	2432	2432
2578	2021	20		2578	2432		
2	2578			50			
	1769	25	1784	2021	2500		
2609		26		2432	1637LV	1637LV	1637LV
2432		40	2609	1769	2609	2578	2578
2021	2432	45	2021	25		1769	1769
2500	2500	50	2432	15	1769	2609	2609
1637LV	1637LV	50	2021	7		2500	2500
	2609	70	1637LV		2021		
	2578		2578		1784	1784	1784
						2021	2021
Moderate	Moderate	Highest	Highest	Shortest	Poor	Fair	Fair



# Aliphatic Curing Agents

Curing Agent	Generic Type	UV Resistance	Chemical Resistance	Fast Cure	Economics	Carbanation Resistance	Pot Life	Flexibility	Low Viscosity	Anti-corrosive System	Colour (Gardner)	Viscosity (mPa.s @ 25°C)	Amine Value (mg KOH/g)	Specific Gravity (@ 25°C)	Flash Point (°C)	AHEW	Loading (PHR)	Gel Time (Minutes)	Thin Film Set Time (Hours)	Tg (°C)	HDT (°C)	Comments / Applications	Labelling	R&S Phrases
Ancamine 2609	Mannich Base		●	●					●	●	3	300-700	380-410	1.01	130	75	40	15	2	-	-	Ancamine 2609 is a low viscosity Mannich base curing agent that is moisture tolerant. Suitable for potable water and food contact coatings.	C, N	R20/22, R35, R43, R51/53, S26, S36/37/39, S45, S61
Ancamine 2578	Adduct		●	●		●	●			●	5	2000-3000	250-270	1.01	23	175	90	70	1.5	-	-	Ancamine 2578 is a 60% solids modified aliphatic polyamine adduct that exhibits fast cure under adverse conditions of high humidity and will cure at temperatures as low as 0°C.	Xn	R10, R22, R37/38, R41, R67, S13, S26, S37/39, S46
Ancamine 2500	Mannich Base			●							7	1400-1650	350-380	1.07	96	135	70	16	3	-	49	Ancamine 2500 is particularly well suited for use in concrete coatings and patch repair mortars / grouts that need to be applied at low temperatures. It can also be used as an accelerator for other systems and maintains flexibility.	C	R20, R35, R43, S9, S26, S36/37/39, S45
Ancamine 2432	Modified		●	●					●	●	4	200-400	350-380	1.10	>113	88	46	27	2	55	55	Ancamine 2432 imparts very rapid development of physical properties at both ambient and low temperatures, yielding formulations with outstanding chemical resistance, making it ideal for secondary containment linings and other chemical resistant systems.	C	R20/22, R35, R43, S9, S26, S36/37/39, S45
Ancamine 2422	Modified		●								3	2000-2500	665-690	1.12	>100	49	26	-	-	-	-	A high functional phenol free aliphatic amine imparting good working time with multi-functional / novolac epoxy resins. Ancamine 2422 systems provide high chemical resistance against most aggressive reagents making it ideal for tank linings and secondary containment. This product requires plasticisation or heat cure to achieve full properties.	C	R20, R35, R43, R52/53, S26, S36/37/39, S45, S61
Ancamine 2410	Isolated Adduct		●			●					3	20500	444-480	1.17	>204	85.5	45	-	-	-	-	An isolated adduct with low odour and low free amine content, for use in FDA compliant coatings, tank linings and other chemical resistant systems, Ancamine 2410 offers both fast dry speeds and good chemical resistance. Due to its high viscosity this curing agent is commonly used as a co-curative or in its solvanted form (Ancamine 2410B75)		Not hazardous
Ancamine 2410B75	Isolated Adduct Solution		●			●					2	11000 14000	340-380	1.05	72	114	60	30	2	50	-	Ancamine 2410B75 is a 75% solids version of Ancamine 2410, diluted in butanol for easier handling.	Xn	R10, R20/22, R37/38, R41, R67, S7, S9, S13, S26, S37/39, S46
Ancamine 1784	Modified Amine					●	●	●	●		3	30-100	290-320	0.95	107	76	40	100	12	52	50	Ancamine 1784 is moisture insensitive and relatively resistant to blushing, ideal for use in combination with other cycloaliphatic / aliphatic curing agents to increase working time. It can also be used in laminates, adhesive and castings.	C, N	R22, R34, R50/53, R62, R63, S26, S36/37/39, S45, S60, S61
Ancamine 1769	Modified Adduct					●	●				4	600-900	975	1.01	175	48	25	24	4	53	99	Designed for use in potting, adhesives, gel-coats, small and heavily filled castings, Ancamine 1769 is a hydroxalkylated polyamine with low vapour pressure, low shrinkage and reduced skin irritation.	Xi	R36, R43, S26, S36/37/39, S45
EDA Adduct 870-XB-50	Epoxy EDA isolated adduct solution in Butanol:Xylene					●					5	1500-4000	76-04	0.99	23	370	80-100	-	-	-	-	An isolated amine adduct for use in general purpose marine and industrial coatings. This adduct exhibits low odour, low free amine content and irritation potential. Also benefits from fast lacquer dry and inherent flexibility.	Xn	R10, R20/21/22, R37/38, R41, S7, S13, S25, S26, S36/37/39,S46

# Cycloaliphatic Curing Agents

Focused Product Selection

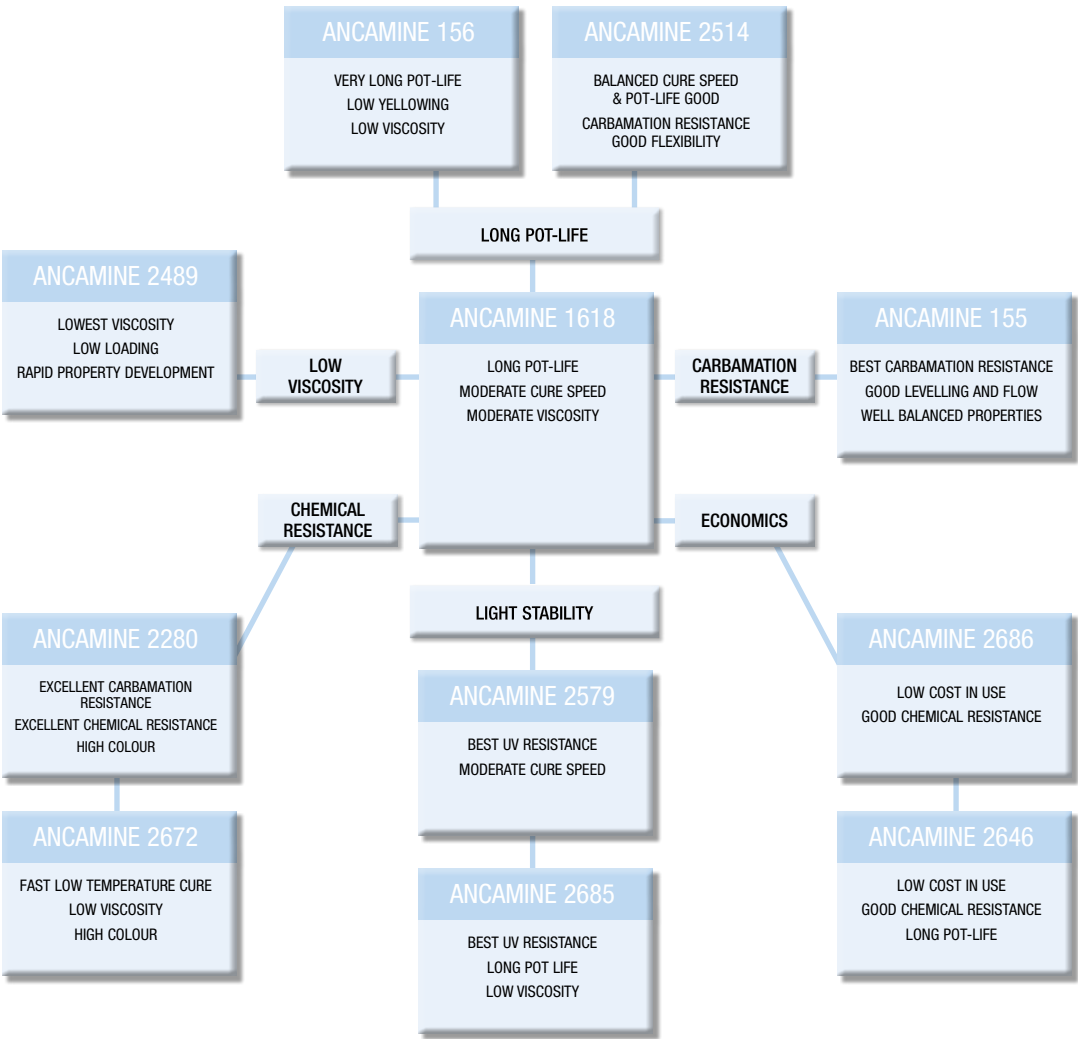


## Principal properties

- Very good chemical resistance
- Excellent gloss
- Good cure at low temperature

## Principal applications

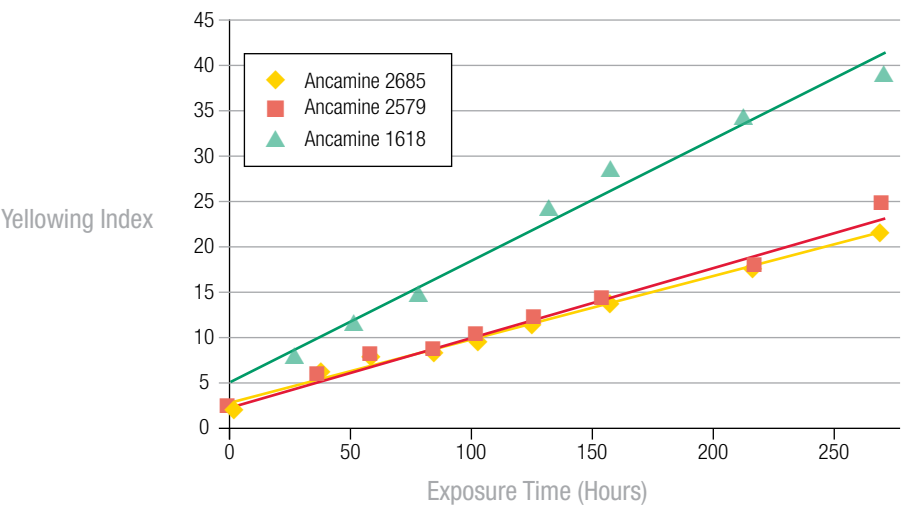
- Solvent-free coatings
- Self-levelling and screed floors
- Tile grouts and adhesives



## Ancamine 2685

Ancamine 2685 curing agent exhibits low colour, low viscosity and excellent colour stability offering superior yellowing resistance vs conventional cycloaliphatic polyamine curing agents.

These properties make Ancamine 2685 curing ideal for low yellowing flooring applications.



## Ancamine 2686

Based upon Air Products' cycloaliphatic amines, Ancamine 2686 offers exceptional cost-in-use economics and a broad balance of chemical resistance and surface appearance properties. Ancamine 2686 curing agent provides high mechanical build, rapid cure and is particularly suitable for lower temperature use.

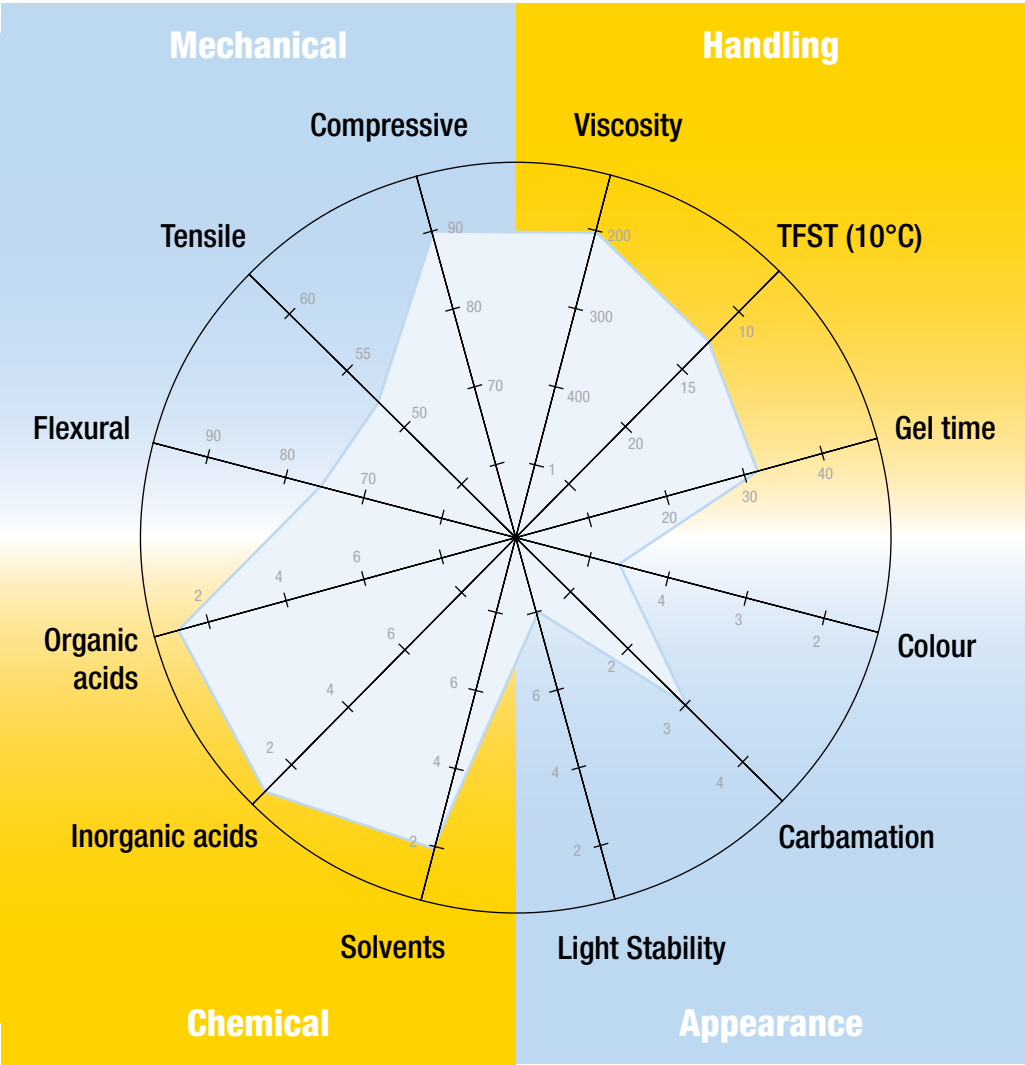




Initial Colour (Gardner)	Colour Stability	Usage Rate (PHR)	Viscosity (mPa.s @ 25°C)	Pot-Life (mins)	Cure Rate at Low Temperature (TFST)	Carbamation Resistance (adverse conditions)	Chemical Resistance	
							Aqueous acids	Solvents
Low	Excellent	Lowest	Lowest	Longest	Excellent	Good	Very good	Very good
1	2579 2685	45 2489	50 2489 2196 2519	80 1934	2672	2280 155	2672	2672
2143 2579 2685	2143	2196 2379	2379 1693		2072 2489 155	2514 2519 2685 2579		2280 2686
156	1618 1934	50 1934 2519	156 2672 1934 2685 2072 2514 155 2686	2689 2280 2685 156 1618		156 2143 2489	2280 2689 2143 2514	
2379	156 2196	52 1934	1618	30 2579 2143	2686 2519	2672	155 156 1618 2685 2579 149	2143
1934	2515 2519 2514 1618	2514 2686 2672 155 156	300 2686	40 2379	2072	2196 2143 156 1618 2579 2379	2379 2072	2514 2519
2519	2379	60 2072 2685	450 2579 149	2514 149	1934	2072	1934	
2	2514	55 2072 149	600 2143	25	2280 2685			
2514	2672	65 2280 149	800 155 2489 2072 2519		1934			1934
1618	2280 2686							
149 155								
3								
2072 2672								
2280								
2689								
Moderate	Moderate	Highest	Highest	Shortest	Poor	Matt/Carbamation	Fair	Fair

Ancamine 2672 was developed as the next generation of cycloaliphatic hardeners to meet current increased legislation on alkylated phenols and Bisphenol A. (These raw materials now have the R62 and R63 risk phrases which are ‘possible risk of impaired fertility’ and ‘possible risk of harm to the unborn child’ respectively.) Working in close collaboration with one of our customers in a relatively short period of time, Ancamine 2672 has shown to have similar handling properties, cure speed and end performance to the incumbent technology and illustrates Air Products’ commitment to increasing environmental directions in Europe, and globally.

Offering the best chemical resistance from our range of cycloaliphatic curing agents against aqueous acids and solvents, Ancamine 2672 is ideal for use in flooring systems and tank linings. For more information on this grade please contact your local sales or technical representative.



# Cycloaliphatic Curing Agents

Focused Product Selection

Curing Agent	Generic Type	UV Resistance	Chemical Resistance	Fast Cure	Economics	Carbamation Resistance	Pot Life	Flexibility	Low Viscosity	Anti-corrosive System	Colour (Gardner)	Viscosity (mPa.s @ 25°C)	Amine Value (mg KOH/g)	Specific Gravity (@ 25°C)	Flash Point (°C)	AHEW	Loading (PHR)	Gel Time (Minutes)	Thin Film Set Time (Hours)	HDT (°C)	Comments / Applications	Labelling	R&S Phrases
Ancamine 2686	Modified Cycloaliphatic Amine Adduct				●	●					12	100-400	300-350	1.02	>100	95	50	35	4	45	Based upon Air Products' cycloaliphatic amine technology, Ancamine 2686 offers excellent economics and excellent chemical resistance. Ancamine 2686 provides high mechanical build, rapid cure and is suitable for lower temperature use.	C	R20/22, R34, R52/53, S26, S36/37/39, S45, S60
Ancamine 2646	Modified Cycloaliphatic Amine Adduct				●						12	100-400	360-390	1.03	>100	95	50	45	5	45	Ancamine 2646 is a long pot life version of Ancamine 2686, making it ideal for use in warmer climates such as the Middle East or southern Europe.	C	R20/22, R34, R43, S26, S36/37/39, S45
Ancamine 2685	Modified Cycloaliphatic Amine Adduct	●					●	●			3	100-250	310-350	1.01	93	90	48	95	6	45	Ancamine 2685 exhibits low colour, low viscosity and superb colour stability versus conventional cycloaliphatic curing agents making Ancamine 2685 ideal for low yellowing flooring applications where high aesthetics are a prerequisite.	C	R20/21/22, R34, R43, R52/53, S3, S26, S36/37/39, S45, S60
Ancamine 2579	Modified Cycloaliphatic Amine Adduct	●					●				3	400-800	260-300	1.04	>100	115	60	40	5.5	45	Similar to Ancamine 2685, Ancamine 2579 also offers superb UV resistance but offsets viscosity for an improved cure speed.	C	R20/21/22, R34, R43, R52/53, S26, S36/37/39, S45, S61
Ancamine 2519	Modified Cycloaliphatic Amine Adduct			●		●		●	●		2	100-300	300-330	1.01	>100	95	50	23	3.5	45	Ancamine 2519 is a low viscosity curing agent which exhibits good carbamation resistance at temperatures down to 10°C. It can be used to formulate high solids coatings, self levelling and screed floors with good all round performance.	C	R20/22, R34, R43, R52/53, S9, S26, S36/37/39, S45, S61
Ancamine 2608	Modified Cycloaliphatic Amine Adduct			●		●		●			2	150-250	310-340	1.04	>100	95	50	20	3.5	45	Ancamine 2608 is a low viscosity curing agent which exhibits good carbamation resistance at temperatures down to 10°C. It can be used to formulate high solids coatings, self levelling and screed floors with good all round performance.	C	R20/22, R34, R43, R52/53, S9, S26, S36/37/39, S45, S61
Ancamine 2514	Modified Cycloaliphatic Amine Adduct			●		●	●		●		3	100-500	285-315	1.03	>100	93	50	33	3.5	45	Similar to Ancamine 2519, but with slightly improved low temperature cure.	C	R20/21, R35, R43, R52/53, S9, S26, S36/37/39, S45, S61
Ancamine 2489	Modified Cycloaliphatic Amine Adduct			●				●			3	50-125	345-375	1.04	>100	83	44	20	3.5	45	Suitable for use in primers, paints, self levellers and mortars, this ultra low viscosity curing agent reduces the need for diluents, whilst still maintaining good carbamation resistance and low temperature property development.	C	R20/21/22, R35, R43, R52/53, S9, S26, S36/37/39, S45, S61
Ancamine 2379	Modified Cycloaliphatic Amine Adduct							●			2	70-110	250-350	1.00	166	86	47	30	8	48	Similar performance to Ancamine 1618, but with lower use levels and viscosity.	C	R20/21/22, R34, R43, R52/53, S9, S26, S36/37/39, S45, S61
Ancamine 2672	Modified PolyCycloaliphatic Amine		●	●		●					5	100-30	280-340	1.06	95	95	50	30	5	48	Ancamine 2672 is a Bisphenol A free variant of Ancamine 2320, that provides good low temperature reactivity, low viscosity and high acid resistance, making it the ideal choice for chemically resistant primers, mortar floors and tank linings.	C	R20/22, R35, R43, S26, S36/37/39, S45, S60
Ancamine 2280	Modified PolyCycloaliphatic Amine		●			●			●		13	360-700	230-260	1.08	93	110	58	50	7	50	Ancamine 2280 exhibits high chemical resistance similar to some aromatic systems. Ideal for industrial chemical resistant flooring and secondary containment.	Xn	R20/22, R41, R52/53, S26, S36/37/39, S45, S60



# Cycloaliphatic Curing Agents

Focused Product Selection

Curing Agent	Generic Type	UV Resistance	Chemical Resistance	Fast Cure	Economics	Carbamation Resistance	Pot Life	Flexibility	Low Viscosity	Anti-corrosive System	Colour (Gardner)	Viscosity (mPa.s @ 25°C)	Amine Value (mg KOH/g)	Specific Gravity (@ 25°C)	Flash Point (°C)	AHEW	Loading (PHR)	Gel Time (Minutes)	Thin Film Set Time (Hours)	HDT (°C)	Comments / Applications	Labeling	R&S Phrases
Ancamine 2143	Modified Cycloaliphatic Amine Adduct	●	●			●	●			●	2	500-700	250-260	1.04	112	115	60	45	7	46	With good initial colour / colour stability and gloss, Ancamine 2143 offers superior overall performance to Ancamine 1618.	C,N	R20/22, R35, R51/53, S26, S36/37/39, S45, S57, S60
Ancamine 1934	Modified Cycloaliphatic Amine Adduct	●					●				3	140-360	265-295	1.02	100	100	50	80	14	40	Ancamine 1934 is a long pot life variant of Ancamine 1618, making this adduct ideal for use in warmer climates such as the Middle East or southern Europe.	C	R20/21/22, R34, R43, S26, S36/37/39, S45
Ancamine 1618	Modified Cycloaliphatic Amine Adduct	●			●		●				2	300-600	260-285	1.03	95	115	60	40	7	46	With its long track record, Ancamine 1618 is the established industry standard cycloaliphatic. This product provides good overall performance making it a suitable choice for a multitude of applications in the civil engineering sector.	C	R20, R34, R43, R52/53, S26, S36/37/39, S45, S61
Ancamine 156	Modified Cycloaliphatic Amine Adduct	●				●	●				3	100-200	320-340	1.04	105	95	50	45	7	45	Ancamine 156 has a good dry speed to pot life balance, colour stability and low viscosity. Ideal for quartz flooring and mortars.	C	R20/21/22, R34, R43, R52/53, S26, S36/37/39, S45, S61
Ancamine 155	Modified Cycloaliphatic Amine Adduct					●					3	300-400	300-320	1.05	105	95	50	27	6	45	Compared to conventional cycloaliphatics, Ancamine 155 offers class leading carbamation and early water spotting resistance. Ideal for industrial flooring, self levelling floors and screeds.	C	R20/21/22, R34, R43, R52/53, R62, S26, S36/37/39, S45, S61
Ancamine 149	Modified Cycloaliphatic Amine Adduct			●		●					3	500-700	285-305	1.03	107	115	60	30	5.5	46	Ancamine 149 is an accelerated version of Ancamine 1618, offering enhanced cure at lower temperatures.	C	R20/22, R34, R43, R52/53, S9, S26, S36/37/39, S45, S61

## Heat Cure

Amicure PACM	Methylene di(cyclohexylamine)		●				●		●		1	80	526	0.96	>90	52.5	28	213	-	149	Low colour, low viscosity alternative to aromatic amines, giving comparable properties with improved fracture toughness. Suitable for use in filament winding, casting and wet lay-up laminating applications.	C,N	R22, R35, R51/53, S26, S36/37/39, S45, S61
Ancamine 2264	Polycycloaliphatic Amine		●				●				9	2600	502	1.00	>108	54	29	195	-	162	Ancamine 2264 and Ancamine 2167 are designed for use in industrial composite applications where heat cure is used. They offer high Tg, good impact resistance, fracture toughness and excellent chemical resistance	C,N	R22, R34, R51/53, S26, S36/37/39, S45, S57, S60
Ancamine 2167	Polycycloaliphatic Amine		●				●				3	210	520	0.98	>108	53	28	210	-	161	Ancamine 2264 and Ancamine 2167 are designed for use in industrial composite applications where heat cure is used. They offer high Tg, good impact resistance, fracture toughness and excellent chemical resistance	C,N	R22, R35, R51/53, S26, S36/37/39, S45, S57, S60

# Amidoamine Curing Agents

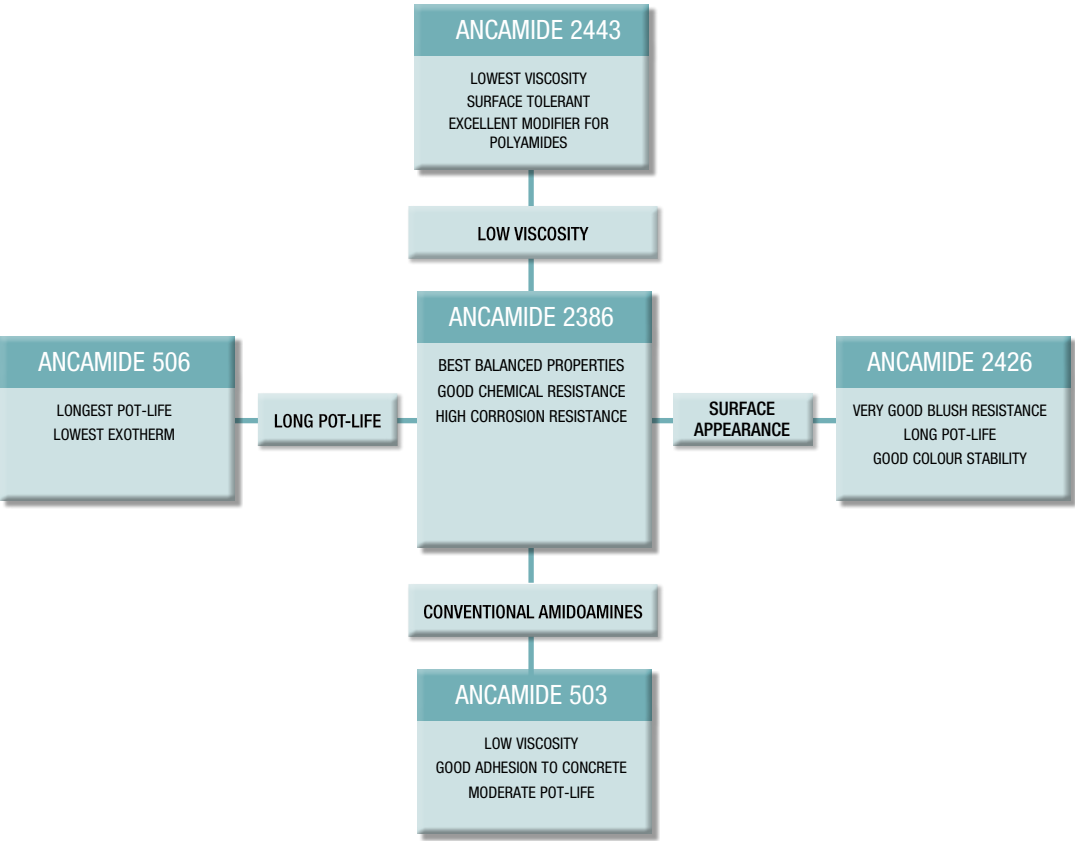
Focused Product Selection

## Principal properties

- Low viscosity
- Good adhesion to concrete and damp substrates
- Good cure under humid conditions

## Principal applications

- Concrete bonding, crack injection, screed floors
- Water-wipeable tile grouts
- Adhesives
- Coatings – typically as modifiers to other curing agents



Usage Rate (PHR)	Viscosity (mPa.s @ 25°C)	Pot-Life (mins)	Cure Rate at 15-25°C	Film Flexibility	Solvent Resistance
Lowest	Lowest	Longest	Fastest	Excellent	Very Good
501	2443	506	501	506	2386
2443	2386	2443	2386	2426	501
2386	500	2426	503	2443	2426
2426	506	500	500	503	2443
500	503	503	2443	2386	500
503	501	501	2426	501	503
506	2426	501	506	506	506
50-70	600	100	503		
60-90	700	50			
Highest	Highest	Shortest	Slowest	Good	Poor



# Amidoamine Curing Agents

Curing Agent	Generic Type	Adhesive Strength	Chemical Resistance	Fast Cure	Economics	Surface Appearance	Pot Life	Flexibility	Low Viscosity	Anti-corrosive System	Colour (Gardner)	Viscosity (mPa.s @ 25°C)	Amine Value (mg KOH/g)	Solids (%)	Specific Gravity (@ 25°C)	Flash Point (°C)	AHEW	Loading (PHR)	Gel Time (Minutes)	Thin Film Set Time (Hours)	Tg (°C)	Comments / Applications	Labelling	R&S Phrases
Ancamide 2443	Modified Amidoamine	●				●	●		●	●	9	30-100	510-560	100	0.97	93	85.5	45	250	11	56	Our lowest viscosity, plasticiser free amidoamine with long pot life and good blush resistance. Ancamide 2443 has good adhesion to concrete and poorly prepared substrates. This grade is also ideal for use as a viscosity reducer or pot life extender for other systems.	C, N	R21, R34, R43, R51/53, S26, S36/37/39, S45, S61
Ancamide 2426	Modified Amidoamine					●	●				8	500-750	360-400	100	0.96	>204	93	49	285	13	46	Ancamide 2426 is a low viscosity, long pot life amidoamine with good resin compatibility and low bloom without the need for an induction period. Ancamide 2416 is 100% solids, and allows for solvent free coatings.	C, N	R34, R43, R51/53, S26, S36/37/39, S45, S61
Ancamide 2386	Aliphatic Amidoamine	●	●		●	●	●			●	10	170-520	245-385	100	1.00	113	93	49	135	8	51	High performance modified amidoamine with low bloom tendency, high gloss and good low temperature cure compared to other amidoamines. Commonly used in crack injection, primers and anti-corrosive primers.	C, N	R22, R34, R43, R51/53, S26, S36/37/39, S45, S61
Ancamide 506	Aliphatic Amidoamine						●				13	200-500	410-440	100	0.93	160	110	50	385	23	45	Ancamide 506 gives the longest pot-life and highest imidazoline content within our amidoamine range. Can be used in concrete repair, electrical encapsulation and as a pot life extender for cycloaliphatic curing agents.	C, N	R34, R43, R51/53, S26, S36/37/39, S45, S61
Ancamide 503	Aliphatic Amidoamine			●							10	300-500	490-520	100	0.95	154	95	50	70	9	48	Faster version of Ancamide 500, non-corrosive.	Xi, N	R36/38, R43, R51/53, S26, S36/37/39, S45, S61
Ancamide 501	Accelerated Aliphatic Amidoamine		●	●							10	450-800	520-570	100	0.99	126	68	35	40	7.5	47	A versatile accelerated amidoamine for the civil engineering market that is used in patch repair, tile grouts and general adhesives.	C, N	R34, R43, R51/53, R62, S26, S36/37/39, S45, S61
Ancamide 500	Aliphatic Amidoamine						●				11	200-450	420-480	100	0.95	195	90	50	180	12	45	Ancamide 500 is a low viscosity, long pot life curing agent that allow latitude with regards to mixing ratios. It is ideal for bonding old to new concrete, crack injection, electrical encapsulation and for use in general adhesives.	C, N	R34, R43, R51/53, S26, S36/37/39, S45, S61

# Polyamide Curing Agents

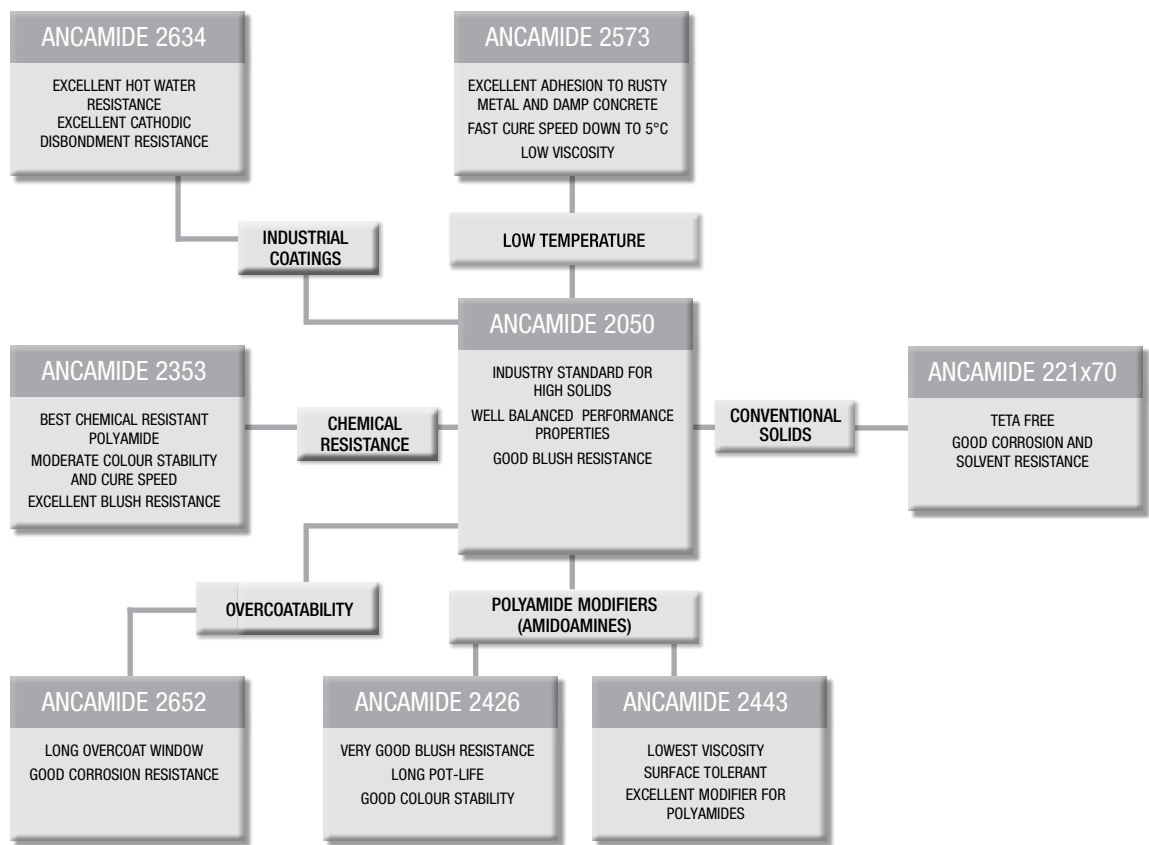
Focused Product Selection

## Principal properties

- High corrosion resistance
- Good flexibility
- Long pot-life

## Principal applications

- Heavy duty anti-corrosive coating
- Solvent based and solvent free marine coatings
- Structural adhesives



## ‘1 Series’ Polyamides

With ever increasing demands on ethylene amines, such as TETA, availability of this key raw material in the manufacture of polyamides, a standard in many coatings formulations, is becoming a concern to the global Marine and Protective Coatings’ markets.

Market dynamics over the past few years and continuing have seen significant shortages and price volatility and it is the aim of these products, as well as new derivatives from this program, to offer the customer not only security of supply but also potentially enhanced long-term economics. Through customer intimacy and relationships this program is another example of Air Products’ commitment for continued use of proprietary innovative amine technology to bring new technology to the end market that offers a novel solution to the many challenges facing our customers. The ‘type 1’ polyamides allow Air Products now to have a level of back integration for polyamide manufacture, with the amine component, and this coupled with our global purchasing power of other raw materials provides us with significant leverage in the European and wider markets that we have previously not seen.

## Ancamide 2652

The world is becoming a small place, so we are told, but in a time where continued economics are driving prices and margins down, the distance and period between when a metal primer is applied to when it may be re-coated and fabricated is increasing. The coating of steel sections in the protective and marine coating sectors is becoming more and more geographically remote from where these are brought together into fabricated structures for bridges, ships and other structures. This global growth in the coating’s market coupled with ongoing VOC requirements continue to bring challenges in high performance protective coatings to the formulator and applicators alike.

This increased geographical separation has resulted in a requirement for metal primers offering a three to six months re-coat window with common overcoat polymer chemistries such as epoxy and polyurethane systems. Conventional high solids epoxies have only limited re-coat windows, leading to higher costs for surface pre-treatment and extended down times through water and chemical washing and in some cases mechanical abrasion. With Air Products knowledge of these markets and our capability to develop new Innovative technology through our global research and development groups we have produced a new generation of polyamide that here offers significantly increased performance to negate the over coating issues, whilst maintaining other properties such as cure speed and anti-corrosive performance that are prerequisites in the metal protection markets.

Time between primer application and fabrication can be up to six months





# Polyamide Curing Agents

## Comparison Summary

Compatibility with Epoxy Resin	Cure Rate below 15°C	Tendency to Blush	Film Flexibility	Colour Stability	Chemical Resistance	
					Aqueous acids	Solvents
Excellent	Good	None	Excellent	Very Good	Moderate	Excellent
2573 2445 2353 2050 2137 2652	2573 2445 2353 2137	2573 2445 2353 2652	1691 702B75 220, 221 220X70/ 221X70	220, 221 220X70/ 221X70 260A, 261A 805 350A, 351A	2353 2137	2353
1691 702B75	702B75 1691 2050	1691 220X70/ 221X70 220, 221	260A, 261A 2050 2445	1691 702B75	2445 2573 2050	2652 805 350A, 351A 260A, 261A 220X70/ 221X70 220, 221 2573
805 350A, 351A	805 350A, 351A	2050 2137	2652 2573 350A, 351A 805	2652 2445	702B75 1691	2652 2445 2050 2137
260A, 261A	2652 260A, 261A	260A, 261A	2353 2137	2050 2573 2137	2652	805 350A, 351A 260A, 261A 220X70/ 221X70 220, 221
220, 221 220X70/ 221X70	220, 221 220X70/ 221X70	400 805 350A, 351A		2353	805 350A, 351A 260A, 261A 220X70/ 221X70 220, 221	702B75 1691
Good	Poor	Slight	Moderate	Moderate	Poor	Moderate





# Polyamide Curing Agents



Curing Agent	Generic Type	UV Resistance	Chemical Resistance	Fast Cure	Economics	Carbamation Resistance	Pot Life	Flexibility	Low Viscosity	Anti-corrosive System	Colour (Gardner)	Viscosity (mPa.s @ 25°C)	Amine Value (mg KOH/g)	Solids	Specific Gravity (@ 25°C)	Flash Point (°C)	AHEW	Loading (PHR)	Gel Time (Minutes)	Thin Film Set Time (Hours)	Comments / Applications	Loading	R&S Phrases
Ancamide 2573	Modified Polyamide			●		●			●	●	8	1200-2200	275-290	100	1.01	76	115	60	80	5.5	This low viscosity curing agent exhibits fast cure at low temperatures and offers good adhesion onto damp concrete. Ideal as a surface tolerant primer and for use in industrial / marine coatings.	Xn, N	R20/22, R36/38, R43, R50, S24, S26, S37, S61
Ancamide 2445	Modified Polyamide			●		●		●		●	7	4500-6500	180-220	100	1.03	107	150	70-100	90	5	With excellent flexibility, impact resistance and low temperature cure profile Ancamide 2445 is ideal for use in high solids industrial maintenance and marine coatings. Also suitable for use in adhesives, putties, sealants and flexible cable jointing.	Xn	R20/22, R43, S9, S24, S37
Ancamide 2353	Modified Polyamide		●			●				●	9	2800-3500	300-360	100	1.01	93	114	60	65	4.5	Ancamide 2353 offers good low temperature cure and the best chemical resistance from our range of polyamides.	Xi	R36/38, R43, S26, S28
Ancamide 2137	Accelerated Polyamide Adduct			●					●	●	7	1500-2000	293-308	100	1.04	97	150	70-100	27	3	Ancamide 2137 is a lower viscosity, shorter pot life, faster thin film set time version of our Ancamide 2050.	Xn	R20/22, R41, R43, R52/53, S24, S26, S37/39, S61
Ancamide 2050	Accelerated Polyamide Adduct	●				●		●		●	12	2000-5000	210-230	100	1.02	97	150	70-100	140	7 (70phr)	A low viscosity polyamide adduct that offers good resistance to blush and exudation with no induction time. Offering excellent flexibility and impact resistance this curing agent is ideal for use in coatings, adhesives, putties, sealants and flexible cable jointing.	Xn, N	R20/22, R43, R50, S24, S37, S61
Ancamide 1691	Polyamide Adduct Solution						●	●	●	●	10	300-1300	120-145	58-62	0.94	27	550	110 with SER (EEW = 500)	~1-2 days in solution	Touch dry on evaporation of solvents	Adduct of Ancamide 220, 60% solution in butanol / xylene (4:1 by weight). Offers good compatibility with epoxy resins without induction and better cure in adverse conditions. Fast touch dry coatings can be achieved by using Ancamide 1691 in conjunction with solid resins.	Xn	R10, R20/21, R38, R41, S26, S36/37/39, S46
Ancamide 805	Polyamide								●	●	7	2000-2500	420-470	100	0.99	171	124	66-70	60	6.5	Lower viscosity variant of Ancamide 350A type, that is suitable for use in general purpose maintenance coatings.	Xi	R36/38, R43, S24, S26, S37
Ancamide 702B75	Reactive Polyamide Adduct in Butanol			●			●	●	●	●	8	4000-8000	230-260	75	0.96	-	170	90	180	-	Ancamide 702B75 is a low TETA containing adduct of Ancamide 351A (75% solution in butanol) that offers excellent adhesion and cure under adverse conditions without the need for an induction period.	Xn	R10, R22, R37/38, R41, R43, R67, S3, S24, S26, S37/39, S60
Ancamide 350A	Reactive Polyamide								●	●	10	9000-15000	365-395	100	0.97	122	95	50-55	235	11	Industry standard low viscosity Polyamide.	Xn	R36/38, R43, S24, S26, S37
Ancamide 351A	Reactive Polyamide				●				●	●	8	10000-20000	350-390	100	0.97	122	95	50-55	150	10	Ancamide 351A is a low TETA variant of Ancamide 350A. It is commonly used in adhesives, sealants, putties, flexible cable jointing and high solids coatings.	Xi	R43, S24, S37, S60
Ancamide 260A	Reactive Polyamide							●		●	10	35-45 Pa. s	330-360	100	0.96	>93	110	60	200	10	Industry standard medium viscosity Polyamide.	Xi	R36/38, R43, S24, S26, S37
Ancamide 261A	Reactive Polyamide				●			●		●	7	35-45 Pa. s	320-380	100	0.96	>93	110	60	75	7	Ancamide 261A is a low TETA variant of Ancamide 260A. Common applications include adhesives, sealants, putties, flexible cable jointing and high solids coatings.	Xi	R43, S24, S37, S60
Ancamide 220X70	Reactive Polyamide Solution				●		●	●	●	●	9	700-2000	160-190	68-72	0.94	24	340	70	Depends on solvent blend	Depends on solvent blend	Industry standard high viscosity Polyamide.	Xn	R10, R20/21, R36/38, R43, S26, S36/37
Ancamide 221X70	Reactive Polyamide Solution				●		●	●	●	●	9	1000-2500	145-165	68-72	0.94	30	340	50-70	Depends on solvent blend	Depends on solvent blend	A TETA free variant of Ancamide 220X70. Ancamide 221X70 is diluted to 70% solids in xylene and offers good colour, colour stability, chemical and corrosion resistance for the general protective coatings market.	Xn	R10, R20/21, R38, S36/37, S60
Ancamide 220	Reactive Polyamide				●			●		●	9	>350 Pa. s	235-250	100	0.97	>130	240	40-60 with SER (EEW =	Depends on solvent blend	Depends on solvent blend	Industry standard semi-solid Polyamide	Xi	R36/38, R43, S24, S26, S37
Ancamide 221	Reactive Polyamide				●			●		●	9	>350 Pa. s @ 40°C	205-235	100	0.99	>130	240	40-60 with SER (EEW = 500)	Depends on solvent blend	Depends on solvent blend	A TETA free variant of Ancamide 220. Ancamide 221 offers high flexibility and long pot life. Used in combination with solid epoxy resin for solvent based coatings; can be used with liquid epoxy resins in adhesives.	-	Not hazardous
Ancamide 2652	Reactive Polyamide Solution					●		●		●	8	1700	132	80	0.98	37	250	90-130	Depends on solvent blend	Depends on solvent blend	Ancamide 2652 has been specifically developed to provide long overcoatability with epoxy and polyurethanes, whilst maintaining the performance properties you expect from a polyamide.	Xi	R10, R38, R41, R43, S25, S26, S36/37/39
Ancamide 2634	Reactive Polyamide Solution		●		●	●				●	7	1700	335	80	0.96	44	95	50	>180	7	Ancamide 2634 is a modified polyamide for cost effective protective coatings and interior pipeline solvent based systems. This grade offers good cure speed, high corrosion / chemical and cathodic disbondment.	Xn, N	R10, R22, R37/38, R41, R43, R51/53, R67, S9, S26, S33, S36/37/39, S45



# Aliphatic Amines, Dicyandiamides and Imidazoles



## Aliphatic Amine Based Latent Curing Agents

Product	Appearance	Latency (months @40°C)	Activation Temperature	Economics	Mpt	Amine Value	Use Level (sole)	Use Level (Dicy accelerator)	Latency (months @40°C)	DSC Activation Temp (sole)	DSC Activation Temp (Dicy accelerator)	Tg (sole)	Tg (Dicy accelerator)	Typical Cure Schedule	Comments / Applications	Labelling	R&S Phrases
Ancamine 2014AS	White Powder	●		●	96	184	25	1-5	>3	109	133	85	110	Dependant on loading / if used as a sole curing agent.	Ancamine 2014AS can be used either as a sole curing agent or as an accelerator for dicy. This product can be used in both 1k adhesives and pre-pregs.	Xi	R36/37, R43, S22, S24, S26, S37, S60
Ancamine 2014FG	White Powder	●	●		96	184	25	1-5	1	109	133	85	110		Ancamine 2014FG is a more highly micronised variant of Ancamine 2014AS, providing faster development of properties.	Xi	R36/37, R43, S22, S24, S26, S37, S60
Ancamine 2337S	Light Yellow Powder		●		63-78	260	45	-	1	70	-	70	-		This product offers rapid reactivity above 70°C. Whilst not being a dicy accelerator, Ancamine 2337S is often used in conjunction with accelerated dicy formulations to provide dual cure aspect and rapid development of green strength for 1k adhesives.	Xn	R36/38, R68, S26, S36/39
Ancamine 2441	White Powder	●			124-135	230	20	1-5	>3	100	124	114	135		This aliphatic blocked amine lends itself for use as an accelerator to both dicy and anhydride systems. Its long latency and high Tg make it ideal for adhesives, potting and the pre-preg market.	Xi	R36/37, S26
Ancamine 2442	White Powder	●			-	115	20	1-5	>3	95	-	112	--			-	Not hazardous

## Dicyandiamides

Product	Appearance	Latency	Activation Temperature	Economics	Mpt (°C)	HEW	Use Level (sole)	Latency (months @ 40°C)	DSC Activation Temp (sole) (°C)	HDT Activation Temp (30mins @ 180°C)	Typical Cure Schedule	Comments / Applications	Labelling	R&S Phrases
Amicure CG1200G	White Powder	●		●	207-211	21	4-15	>6 months	165	121	30 min @ 180°C	Micronised dicy with a particle size of 90% <30 microns with 1.5% flow aid. Used in powder coatings, pre-pregs, adhesives and laminates.	-	Not hazardous
Dicyanex 1400B	White Powder	●		●	207-211	21	4-15	>6 months	165	121	30 min @ 180°C	Micronised dicy with a particle size of 90% <10 microns with 3.0% flow aid. Used in powder coatings, pre-pregs, adhesives and laminates.	-	Not hazardous

## Imidazoles

Product	Appearance	Latency	Activation Temperature	Economics	Mpt (°C)	Mol. Wt	Use Level (sole) (phr)	Latency (hours)	DSC Activation Temp (sole) (°C)	HDT (gel @ 80°C)	Typical Cure Schedule	Comments / Applications	Labelling	R&S Phrases
Imicure Imidazole	White Powder			●	88-90	68	1-4	9	-	147	Dependant on loading / if used as a sole curing agent.	Imicure imidazole is commonly used as an accelerator for dicy and anhydride systems in pre-preg, filament winding and adhesive systems.	C	R22, R34, R63, S22, S26, S37, S45
Imicure AMI-2 tech	White Powder				136-146	82	1-4	8	-	149		This grade of imidazole can be used as a dicy, anhydride and phenolic curing agent accelerator.	C	R22, R34, S22, S26, S36/37/39, S45
Imicure EMI-24	Pale yellow liquid			●		110	1-4	9	95	156		Imicure EMI-24 can be used as either a sole curing agent or as a dicy / anhydride accelerator. It offers high reactivity and may be used in filament winding, electrical laminates and structural adhesives.	Xn	R22, R41, S26, S39
Curezol 2MZ Azine S	Pale yellow powder	●			248-258	219	6 Aug	45 days	145	156		Curezol 2MZ Azine S is a micronised solid imidazole that can be used as either a sole curing agent or as a dicy / anhydride accelerator. It offers the longest latency of the imidazole range.	-	Not hazardous

# Substituted Ureas, BF3 Complexes and Adhesion Promoters for PVC Plastisols



## Substituted Ureas

Product	Appearance	Latency	Activation Temperature	Economics	Green Strength	Mpt (°C)	Mol. Wt	Use Level (phr)	DSC Activation Temp (sole)	Tg (°C)	Typical Cure Schedule	Comments / Applications	Labelling	R&S Phrases
Amicure UR7/10	White Powder				●	130-133	165	0.5-3.0	145	118	Dependant on loading.	Suitable as an alternative for chloro phenol ureas, Amicure UR7/10 is used in the high performance pre-preg and 1k adhesive market.	-	Not hazardous
Amicure UR2T	White Powder				●	182-190	269	0.5-3.0	139	118	Dependant on loading.	Amicure UR2T is a 1,1,'-(4 methyl-m-phenylene)bis(3,3 dimethyl) urea used as an alternative to chloro phenol ureas. This product offers high latency and rapid cure at its activation temperature to provide short cure cycles in pre-pregs or rapid green strength development in 1k adhesives.	-	Not hazardous

## BF<sub>3</sub> complexes

Product	Appearance	Latency	Activation Temperature	Economics	Colour (Gardner)	Viscosity (mPa.s @ 25°C)	Use Level (phr)	Latency (weeks)	DSC Activation Temp (sole)	HDT (4 h at 140°C)	Typical Cure Schedule (hours at 140°C)	Comments / Applications	Labelling	R&S Phrases
Anchor 1040	Orange-red liquid				12	20000	7-12	6-10	100	130	4	Anchor 1040 and Anchor 1115 are chemically modified amine complexes of boron trifluoride designed for use as latent catalytic curing agents for liquid and solid epoxy resin. Cured mechanical properties, heat resistance and chemical resistance are typically excellent but dependant upon concentration and post cure. These grades are commonly used in pre-pregs.	C	R34, R22, S26, S36/37/39, S45
Anchor 1115	Dark liquid		●		17	1700	5-10	6-10	75	140	4		C	R34, S26, S37/39, S45

## Adhesion Promoters for PVC Plastisols

Product	Appearance	Colour (Gardner)	Amine Value (mgKOH/g)	Viscosity (Pa.s @ 25°C)	Use Level (phr)	Comments / Applications	Labelling	R&S Phrases
Nourybond 272	Amber Liquid	10	185-200	15-35	1-4	PVC plastisol adhesion promoters designed to provide adhesion to electro deposition primers used in the manufacture of cars, trucks and buses. These grade are DOP free.	Xi	R36/38, R52/53, S26, S61
Nourybond 276	Amber Liquid	10	110-130	9-28	1-2		-	Not hazardous
Nourybond 289	Clear Liquid	2	-	30-50	4-6	Blocked isocyanate adhesion promoters for use in automotive formulations.	Xn, N	R36/38, R43, R51/53, R62, R63, S26, S36/37, S61
Nourybond 290	Clear Liquid	2	-	2.5-3.5	3-4		Xi	R36/38, S26



# Tertiary Amines, Catalysts and Acrylic PUD Hybrids



## Tertiary Amines

Product	Appearance	Colour (Gardner)	Amine Value (mgKOH/g)	Viscosity (mPa.s @25°C)	Specific Gravity (@ 25°C)	Use Level (PHR)	Gel Time (Minutes)	Typical Cure Schedule	Comments / Applications	Labelling	R&S Phrases
Ancamine K54	Amber Liquid	6	610-635	120-150	0.98	1-15	45	ambient cure	Ancamine K54 (2,4,6 - tri (dimethylaminomethyl) phenol) is the industry standard accelerator in the marine and protective coatings market. Ancamine K54 can be used to accelerate Air Products range of polyamides, cycloaliphatics and amidoamines. It can also be used as an accelerator in anhydride and mercaptan based systems. This accelerator is typically used at levels of 2-5 parts per 100 parts of standard liquid epoxy resin.	C	R22, R34, S26, S36/37/39, S45
Ancamine K61B	Amber Liquid	12	235'248	700	0.97	10-12	35@ 65°C	elevated temperature	A 2-Ethylhexanoic acid salt of Ancamine K54 that offers an extended pot life and lower exotherm on cure. Can be used at relatively low levels (10-12 parts per 100 parts of standard liquid epoxy resin) for small to medium sized castings or to increase the Tg of other systems.	Xi	R36/38, S26
Amicure DBU-E	Light Yellow Liquid	1	MW = 152	14	1.11	1-5	NA		High purity electronic grade of diazabicycloundecene. This accelerator can be used with phenolic novolacs and other epoxy systems including anhydrides.	C	R21/22, R34, R52/53, S26, S36/37/39, S45, S61

## Catalysts

Product	Appearance	Colour (Gardner)	Amine Value (mgKOH/g)	Viscosity (mPa.s @25°C)	Specific Gravity (@ 25°C)	Comments / Applications	Labelling	R&S Phrases
Catalyst 1786B	Amber Liquid	6	-	-		Catalyst 1786B is a 50wt% solution of the p-toluenesulphonate salt of 2-amino-2-methyl-1-propanol in butanol. Widely used in white goods / applications, OEM, drum and pail coatings.	Xn	R10, R22, R37/38, R41, R67, S7, S9, S13, S26, S37/39, S46
Catalyst 2134	Amber Liquid	12	-	35	1.08	Catalyst 2134 is a solution of morpholinium-p-toluene sulphonate in 1-methoxy-2-propanol which permits a reduction of the stoving temperature at which PF, UF and MF cure.	-	R10, S24
Ancamine BDMA	Pale Yellow Liquid	-	MW = 135		0.90	Ancamine BDMA (Benzyldimethylamine) is an accelerator for epoxy resins cured with cycloaliphatic, dicyandiamide, anhydrides, polymercaptans and phenolic resins. Applications include rapid curing adhesives, light coloured coatings / flooring with cycloaliphatic amines, electrical laminates and encapsulation.	C	R10, R20/21/22, R34, R52/53, S26, S36, S45, S61

## Acrylic PUD Hybrids

Product	Appearance	Viscosity (mPa.s @25°C)	Specific Gravity (@ 25°C)	Typical Cure Schedule	Comments / Applications	Labelling	R&S Phrases
Hybridur 870	Milky white dispersion	50-150	1.03	2-7	Hybridur 870 and Hybridur 878 are NMP-free urethane-acrylic hybrid polymer dispersions that exhibit rapid dry, excellent wetting, adhesion and barrier properties when used in ambient cure coatings. Hybridur 870 and Hybridur 878 can be used for both clear and pigmented coating applications for interior and exterior exposure on a variety of substrates such as metal, wood, concrete and plastic.	Xi	R36/37/38, R43, S24, S26, S37
Hybridur 878	Milky white dispersion	35	1.08	2-7		-	Not hazardous



# Diluents and Modifiers

## Comparison Summary

Viscosity Reduction Efficiency	Effect on Surface Tension	Effect on Reactivity	Effect on Heat Resistance	Flexibility/ Adhesion	Toughness	Chemical Resistance	
						Aqueous acids	Solvents
Excellent	Wetting Enhancement	Most Reactive	Retention	Excellent	Excellent	Excellent	Good
746	748	750	757				
748	746		749			746	749
			750			748	750
		757		748	757		
		749		746	750		
					749		
750	750		746				746
749	749	746	748			749	
757	757	748		757		750	
				749	746	757	748
				750	748		
Poor	Adverse Change	Least Reaction	Reduction	Fair	Good	Moderate	Moderate

### Epodil LV5

Epodil LV5 is a new chemically inert, low viscosity hydrocarbon resin that is soluble in and compatible with a wide variety of epoxy resins as well as most curing agents. Used at relatively low loadings (5 -15 phr) it can offer the following benefits to your formulation:

- Improved chemical and acid resistance
- Improved adhesion to substrate (better wetting)
- Improved water resistance

Maintains high level of corrosion resistance



# Diluents and Modifiers



	Product	Chemical name	Colour (Gardner)	Viscosity (mPa.s @25°C)	Specific Gravity (@ 25°C)	Weight content per epoxide	Free ECH content (ppm)	Hydrolizable chloride (%)	Moisture Content (%)	Flash Point (°C)	Comments / Applications	Dilution Efficiency	Labelling	R&S Phrases
Mono-functional Glycidyl Ethers	Epodil 746	2-Ethyl Hexyl Glycidyl Ether	2	2-15	0.91	215-230	10 max	0.1 max	0.1 max	>93	Excellent dilution efficient mono functional diluent, used in coatings and general civil engineering market.		Xi	R43, S24, S37
	Epodil 748	Glycidyl Ether of C12-C14 Alcohol	1	5-20	0.89	275-300	10 max	0.1 max	0.1 max	>93	Epodil 748 is the industry standard mono functional diluent providing low vapour pressure and skin sensitivity. Exhibits good dilution efficiency and imparts a degree of flexibility aiding adhesion to poorly prepared substrates. Used in coatings and general civil engineering market.		Xi	R38, R43, S24, S37
Di-functional Glycidyl Ethers	Epodil 749	Neopentyl Glycol Diglycidyl Ether	1	10-25	1.07	130-145	10 max	0.2 max	0.2 max	>93	This di-functional diluent is used in epoxy systems to maintain a higher level of cross link density compared to mono functional diluents, whilst still providing viscosity reduction by maintaining cross link density, mechanical and chemical properties are better retained.		Xi	R38, R43, S24, S37
	Epodil 750	1-4 Butanediol Diglycidyl Ether	1	15-20	1.11	120-130	10 max	0.1 max	0.1 max	>93	Epodil 750 is widely used in the civil engineering and composite sectors where its combination of dilution profile and low vapour pressure make it the preferred choice.		Xn	R20/21, R36/38, R43, S26, S36/37
	Epodil 757	Cyclohexane dimethanol Diglycidyl Ether	2	45-75	1.10	145-168	10 max	0.15 max	0.15 max	>93	Used predominantly in the composite, laminate and heat cure sectors this diluent imparts excellent maintenance of physical properties.		Xi	R36/38, R43, R52/53, S24, S26, S60, S61
Modifier	Epodil LV5	Hydrocarbon resin	<2	50	1.02	N/A	N/A	<5ppm	0.01%	>116	Epodil LV5 is a chemically inert, hydrocarbon resin that is soluble in and compatible with a wide variety of epoxy resins as well as most curing agents used at relatively low loadings, (5 to 15 phr). Epodil LV5 acts as a surface tension reducer, as a pigment wetting aid, and as an adhesion promoter. Used in civil engineering to improve trowelability or in epoxy mastic coatings for application to poorly prepared surfaces by aiding adhesion.		Xi	R36/38, R37, S25, S26, S37
Resins	Ancarez 2364	Acrylate functional urethane resin	2	25-35 Pa.s)	1.10	450-480	N/A	N/A	N/A	>100	When used with curing agents such as Ancamine 1768 and a mono-functional diluent such as Epodil 748, Ancarez 2364 systems can provide high inherent flexibility coupled with high elongation at break making it ideal for use on car park decks and bridge decks.		Xi, N	R36/38, R43, R51/53, S24, S26, S37, S61
	Ancarez AR555	Water based solid resin dispersion	Milky white	150	1.09	1300	N/A	N/A	45	>100	This zero VOC, novel, low viscosity solid epoxy resin dispersion (supplied at 55% solids) may be used with products such as our Anquamine 419, Anquamine 401 and Anquawhite 100 for rapid cure water based systems. It is ideal for concrete primers / coatings, industrial maintenance primers / top coats.		Xi	R43, S36/37
	Epires ER8	Modified Bis A/F epoxy resin	2	1400-1900	1.12	195	N/A	0.4 max	N/A	>135	Specifically designed for use with our range of water based curing agents, Epires ER8 is a low viscosity, low crystallisation tendency resin.		Xi, N	R36/38, R43, R51/53, S24, S26, S37, S61

A new era in European chemicals management

The new EU chemicals legislation for the Registration, Evaluation and Authorization of Chemicals came into force on 1 June 2007. Known as REACH, the legislation requires companies manufacturing or importing products in the European Union (EU) above certain volumes to register the substances and their uses with the newly created European Chemicals Agency (ECHA).

Air Products’ involvement

At Air Products, we have been preparing for the REACH legislation for some time. Please visit our dedicated website for up-to-date information: [www.airproducts.com/Responsibility/EHS/reach.htm](http://www.airproducts.com/Responsibility/EHS/reach.htm)

Definitions & Calculations

- Amine value** The measurement by means of acid/base titration of the amine nitrogen content in a curing agent. Amine value is expressed in units of mg of KOH equivalent to the basic nitrogen content in a 1g sample (mg KOH/g).
- Pot Life** The ‘working time’ that mixed resin and curing agent exhibits.
- Carbamation** The surface defect of a coating that can occur when curing at too high a humidity or too low a temperature. It is the reaction of carbon dioxide in the air with amine.
- EEW** Epoxide Equivalent Weight.
- AHEW** Amine Hydrogen Equivalent Weight.
- Part A** Epoxy resin component. **Part B** Curing Agent component.

To calculate the quantity of hardener necessary for 100g epoxy resin.

$$\frac{\text{H- Equivalent}}{\text{Epoxy Equivalent}} \times 100 = \text{Weight (g) of hardener per 100g epoxy resin}$$

To calculate the mixing ratio of different epoxy resins with a hardener.

$$\frac{\text{H- Equivalent}}{\text{Epoxy Equivalent 1}} \times \text{Wt \% 1} + \frac{\text{H- Equivalent}}{\text{Epoxy Equivalent 2}} \times \text{Wt \% 2} = \text{Mass of hardener per 100g of Epoxy resin}$$

To calculate different mixes of hardeners.

$$\frac{\text{Total Mass Mixture}}{\frac{\text{Mass Hardener 1}}{\text{H- Equivalent 1}} + \frac{\text{Mass Hardener 2}}{\text{H- Equivalent 2}} + \dots} = \text{H- Equivalent hardener mix}$$



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List of Risk Phrases

R10	Flammable
R11	Highly flammable
R20	Harmful by inhalation
R21	Harmful in contact with skin
R22	Harmful if swallowed
R23	Toxic by inhalation
R24	Toxic in contact with skin
R25	Toxic if swallowed
R34	Causes Burns
R35	Causes severe burns
R36	Irritating to eyes
R37	Irritating to respiratory system
R38	Irritating to skin
R40	Limited evidence of a carcinogenic effect
R41	Risk of serious damage to eyes
R42	May cause sensitisation by inhalation
R43	May cause sensitisation by skin contact
R45	May cause cancer
R48	Danger of serious damage to health by prolonged exposure
R50	Very toxic to aquatic organisms
R51	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R52	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R60	May impair fertility
R61	May cause harm to the unborn child
R62	Possible risk of impaired fertility
R63	Possible risk of harm to the unborn child
R64	May cause harm to breastfed babies
R65	Harmful; may cause lung damage if swallowed
R66	Repeated exposure may cause skin dryness or cracking
R67	Vapours may cause drowsiness and dizziness
R68	Possible risk of irreversible effects

Combined risk phrases

R20/21	Harmful by inhalation and in contact with skin
R20/21/22	Harmful by inhalation, in contact with skin and if swallowed
R20/22	Harmful by inhalation and if swallowed
R21/22	Harmful in contact with skin and if swallowed
R36/38	Irritating to eyes and skin
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R51/53	Toxic to aquatic organisms, may cause long-term adverse effects int he aquatic environment
R52/53	Harmful to aquatic organisms, may cause long-term adverse effects int he aquatic environment

List of safety phrases

S23	Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by manufacturer)
S24	Avoid contact with skin
S25	Avoid contact with eyes
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S28	After contact with skin, wash immediately with plenty of... (to be specified by the manufacturer)
S37	Wear suitable gloves
S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
S46	If swallowed seek medical advice immediately and show this container or label
S60	This material and/or its container must be disposed of as hazardous waste
S61	Avoid release to the environment. Refer to Special Instructions/Safety Datasheet

Combined safety phrases

S24/25	Avoid contact with skin and eyes
S36/37	Wear suitable protective clothing and gloves
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection
S37/39	Wear suitable gloves and eye/face protection

Labelling Summary

E	Explosive
O	Oxidising
F	Highly Flammable
F+	Extremely Flammable
T	Toxic
T+	Very Toxic
C	Corrosive
N	Dangerous for the Environment
Xn	Harmful
Xi	Irritant
N/A	Not Applicable

Amicure CG1200G	40
Amicure DBU-E	44
Amicure PACM	28
Amicure UR2T	42
Amicure UR7/10	42
Ancamide 1691	38
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Ancamine 2280	26
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Ancamine 2379	26
Ancamine 2410	20
Ancamine 2410B75	20
Ancamine 2422	20
Ancamine 2432	20
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Hybridur 870	44
Hybridur 878	44
Imicure AMI-2 tech	40
Imicure EMI-24	40
Imicure Imidazole	40
Nourybond 272	42
Nourybond 276	42
Nourybond 289	42
Nourybond 290	42

Footnotes

- 1 Used with standard, undiluted liquid Bisphenol-A-epoxy, EEW 182-192.
- 2 phr: parts curing agent by weight per 100 parts by weight of epoxy resin.
- 3 Gel time or pot-life in 150g mass at 25°C for room temperature cures.
- 4 Beck-Koller thin film set timer (75 micron wet film) at 25°C phase III.
- 5 Heat distortion temperature (HDT) to ASTM D648.

a) System cured at ambient temperature for 7 days

b) System cured 2 hours at 100°C
- 6 AHEW = Equivalent Weight per active H.

Air Products intend to have full REACH compliance and are committed to the continual improvement of our environmental, health and safety policies with the ultimate goal of zero emissions of toxic and hazardous materials.

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