

## Epoxy Curing Agents and Modifiers

### Anquamine™ 721 Waterborne Curing Agent

#### Preliminary Technical Datasheet

#### DESCRIPTION

Anquamine™ 721 is a waterborne curing agent for use with standard liquid epoxy resin. Anquamine 721 is specifically designed for cost effective concrete floor coatings at up to 300 micron applied film thickness. Anquamine 721 easily emulsifies standard liquid epoxy resins; the use of emulsifiable resins is not required.

#### PERFORMANCE ADVANTAGES

- Cost effective concrete protection
- Fast drying times
- Low colour and good yellowing resistance

#### APPLICATIONS

- Pigmented concrete coatings (100-300 microns)
- Concrete primers

#### STORAGE LIFE

At least 12 months from the date of manufacture in the original sealed container at ambient temperature.

#### HANDLING PRECAUTIONS

Refer to the Material Safety Data Sheet for Anquamine 721 curing agent.

#### TYPICAL PROPERTIES

Appearance	Amber Liquid
Colour <sup>1</sup> (Gardner)	<5
Viscosity <sup>2</sup> @ 25 °C, [Pa.s]	25-45
Amine Value <sup>3</sup> , [mg KOH/g]	150-190
Specific Gravity @ 25°C	1.05
Total Solids Content, [wt %]	48-52
Equivalent Wt{H}	300
Recommended use Level <sup>4</sup> , [PHR]	140-180

#### TYPICAL HANDLING PROPERTIES\*

Pot Life @ 23°C <sup>4</sup> , [hrs]	1-2
Thin Film Set Time <sup>4,5</sup> Phase II @ 23°C, [hrs]	3.5
Phase III @ 23°C, [hrs]	5.5
Persoz Hardness <sup>4</sup> 1 day @ 23°C	175
7 day @ 23°C	260

\* All data generated using a use level of 150 PHR with Bisphenol A diglycidyl ether epoxy resin (EEW=190) at 40% mixed solids

#### TYPICAL PERFORMANCE PROPERTIES

Typical cure schedule	2-7 days
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- 1 ASTM D 1544-80
- 2 Brookfield RVTD, Spindle 4
- 3 Perchloric Acid Titration
- 4 With Bisphenol A diglycidyl ether (EEW=190)
- 5 BK Drying Recorder

## CURING AGENT CHARACTERISTICS

### DILUTION PROFILE

Anquamine 721 waterborne curing agent exhibits good viscosity reduction upon dilution with water. Figure 1 represents the viscosity dilution profiles of Anquamine 721 compared to Epilink® 360 and Epilink 701. Epilink 360 is an industrial standard water soluble polyamide and exhibits high viscosity retention on dilution. Experimental curing agent, Anquamine 721 offers the benefit of a system which shows good viscosity on dilution with retention of viscosity at low solids for cost effective concrete primer and paint applications. This property is ideal to formulate and apply high body paint at low solids.

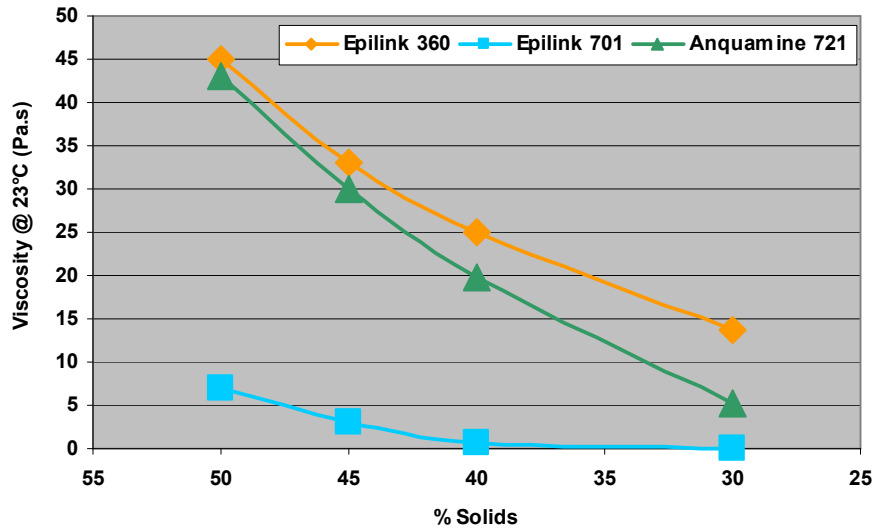


Figure 1 – Dilution profile Epilink® 360, Epilink 701 and Anquamine 721

### POT LIFE PROFILE

The viscosity profile of experimental curing agent Anquamine 721 exhibits a stable viscosity for at least 60 minutes to yield cured coatings with a high and constant gloss and hardness throughout the pot life. After 60-90 minutes a sharp increase in viscosity represents a visible end of pot-life.

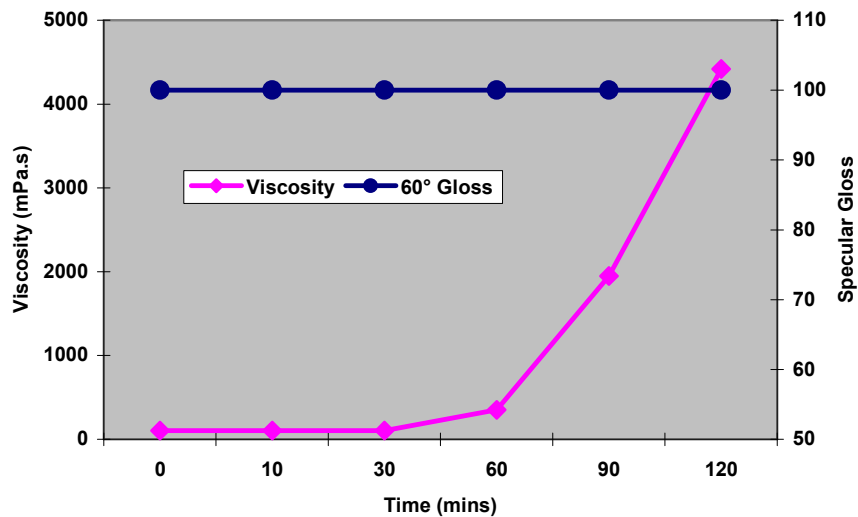
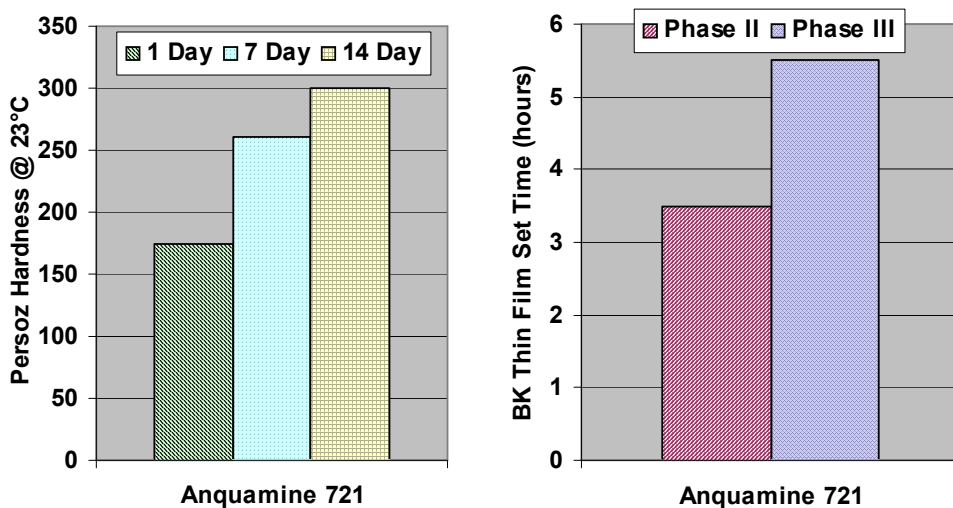


Figure 2 – Viscosity profile and 60° Gloss of Anquamine 721 with Liquid Epoxy Resin

## COATING PROPERTIES



**Figure 3 – Hardness Development and Dry Speed of Anquamine 721 with Liquid Epoxy Resin @ 23°C**

Figure 3 shows the hardness development and Beck Koller, Thin Film Set Times of Anquamine 721 cured with an unmodified Bisphenol A diglycidyl ether epoxy resin using a mix ratio of 150 PHR. Experimental curing agent, Anquamine 721 yields coatings with an ultimate hardness of approximately 300 as measured by Persoz pendulum hardness with undiluted liquid epoxy resin.

It is recommended to use Anquamine 721 at advised stoichiometry of 150PHR (EEW=190). Anquamine 721 can be used at 10-15% above the recommended loading to accelerate hardness development and increase ultimate hardness by 25% without negatively impacting other properties.

## RECOMMENDED EPOXY RESINS

Experimental Curing Agent, Anquamine 721 exhibits good compatibility with standard liquid epoxy resins based on Bisphenol A or F. Reactive diluent modified epoxy resin will offer improved handling and formulating latitude within coating formulations. As with all systems, the inclusion of diluents will retard the hardness development and ultimate hardness of coated films. Resins modified with reactive diluents, such as Epodil® 748 or hexanediol diglycidyl ether, exhibit very good compatibility and produce films of high clarity and gloss. A modification level of approximately 10% to yield a resin viscosity of approx. 2,000mPa.s is ideal to give a good balance of handling and property development.

## DISPERSANTS / DEFOAMERS / WETTING

Defoamers such as Surfynol® DF62 and BYK 045 are very suitable for use in coating formulations to give optimum air release and surface properties. ZetaSperser™ 1600 and Disperbyk 190 can be used to effectively aid in wetting out pigments and increasing flow and levelling properties to give a system which yields good surface and flow properties.

## RHEOLOGY MODIFIERS

The Rheology of formulations with Anquamine 721 can be effectively controlled with the use of Thixotropic agents such as polyurethane thickeners and Bentonite clays. Tafigel® PUR-55 (Münzing-Chemie) has shown good Thixotropic properties in paint formulations with Anquamine 721, allowing for good application viscosity and anti-sag performance. However, due to the inherent thixotropy of Anquamine 721 systems can be formulated without the need of external thickeners.

**START POINT FORMULATION GUIDELINE**  
**GREY MATT PRIMER (ROLLER, BRUSH & SPRAY), WATER DILUTABLE**

*This formulation is ideally suited as a primer or topcoat for concrete floor coatings at 100-300 micron applied film thickness. The highly filled paint provides a cost effective, fast touch dry and good hardness (6H) when cured.*

			Matt Grey Coat
<b>A-Component</b>			
1. Curing agent	Anquamine 721	Air Products	31.00
2. Defoamer	Surfynol DF-62	Air Products	0.25
3. Levelling agent	Surfynol 420	Air Products	0.50
4. Pigment TiO <sub>2</sub>	Kronos 2160	Kronos	8.00
5. Pigment	Carbon Black Flamruss 101	Degussa	0.10
6. Pigment	Bayferrox 1420	Bayer	0.40
7. Filler	Blanc Fix Micro	Sachtleben	16.00
8. Filler	Talc 10M2	Luzenac	11.00
9. Matting Agent	Deuteron MK	Deuteron	4.00
10. Diluent	Water	Local	28.75
			<b>100.00</b>
<b>A-Component Manufacture Procedure:</b>			
<ul style="list-style-type: none"> <li>• Charge components 1-3 and stir homogeneous at low shear</li> <li>• Slowly add pigment and fillers while increasing speed to 10-20 m/s</li> <li>• Grind with high speed disperser at approx. 10-20 m/s for 15min</li> <li>• Add remaining components at low shear rate.</li> </ul>			
* Some of the water may be added during addition of pigments and fillers to adjust viscosity in order to achieve a uniform grind.			
<b>B-Component</b>			
11. Epoxy resin	DER 331	Dow	<b>18.00</b>
12. Reactive Diluent	Epodil 748	Air Products	<b>2.00</b>
<b>Total</b>			<b>120.00</b>

**After mixing Part A and B approximately 10 – 15 parts of water may be required to adjust viscosity for application.**

**Technical Data**

Mixing ratio	Weight	5.0 :1	PVC	%	27.6
	Volume	4.0: 1	Pot-life	minutes	~90
Density (g/ml)	- Part A	1.40	Gloss (85°)		10 – 20
	- Part B.	1.12	BK Dry time 23°C		
	- Mix	1.35		Phase I	hours
Solid Content (weight %)	- Part A	56.0	Phase II	hours	1:00
	- Part B	100.0	Phase III	hours	4:30
	- Mix	63.0	Pencil Hardness		
Mix Viscosity @ 25°C	mPa.s	300	7 day		6H

**DESCRIPTION**

This grey concrete primer system is prepared by mixing Component A with Component B for 2-3 minutes using hand mixing to produce a homogeneous mixture. Once mixed water may be slowly added to give the desired application viscosity and mixed for 1-3 minutes before application. To produce a coating with an initial application viscosity of 300-500 mPa.s, addition of 10 – 15% water is required.

**START POINT FORMULATION GUIDELINE  
CLEAR-COAT PRIMER SYSTEM BASED ON ANQUAMINE 721 WITH LIQUID EPOXY RESIN**

			<b>Clear-coat</b>
<b>A-Component</b>			
1. Curing Agent	Anquamine 721	Air Products	60.0
2. Diluent	Water	Local	15.0
<b>B-Component</b>			
3. Epoxy Resin	DER 331	Dow Chemical	40.0
<b>Sub Total</b>			<b>115.0</b>
<i>Mix part A &amp; B until emulsion is homogeneous</i>			
<b>C-Component - General Primer (40% solids)</b>			
4. Diluent	Water	Local	<b>60.0</b>
<i>After mixing Part A and B, water addition is required to adjust to application viscosity.</i>			

**Technical Data**

Mixing ratio	- A to B to C	weight	75 : 40 : 60
Density	- Part A / B / C	g/ml	1.03 / 1.12 / 1.00
	- Mix	g/ml	1.03
Solid Content	- Part A / B / C	%	40 / 100 / 0
	- Mix	%	40
Pot-life		minutes	60-90
Mix Viscosity	- Initial	mPa.s	200
	- 60 minutes	mPa.s	280
	- 90 minutes	mPa.s	1400
Dry-time (BK Recorder)	- Phase II	hours	3.5
	- Phase III	hours	5.5
Persoz Hardness	24 hour		175
	7 day		260
	14 day		300

**DESCRIPTION**

This clear coating which is ideal as a concrete primer system is prepared by taking 60 parts of Anquamine 721 and diluting to 40% solids. This is then mixed with 40 parts of component B for 2-3 minutes using hand mixing to produce a homogeneous emulsion. Once the emulsion is formed, water is slowly added to give the desired application viscosity and mixed for 1-3 minutes before application. To produce a coating with 40% mixed solids 60 parts of water is required, this will give an initial application viscosity of 100 – 200 mPa.s.