

ANCAMINE® 2685 Curing Agent**DESCRIPTION**

Ancamine 2685 curing agent is a modified cycloaliphatic polyamine intended for use as an ambient curing agent for liquid epoxy resin. 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 agent ideal for low yellowing flooring applications.

ADVANTAGES

- Excellent colour and colour durability
- Good resistance to amine blush and water-spotting
- Low viscosity

APPLICATIONS

- Industrial flooring applications
- Stone carpet floors

SHELF LIFE

At least 24 months from the date of manufacture in the original sealed container at ambient temperature.

HANDLING PRECAUTIONS

Refer to the Safety Data Sheet for Ancamine 2685 curing agent.

TYPICAL PROPERTIES

Appearance	Amber liquid
Colour¹ (Gardner)	≤3
Viscosity² @ 25°C (mPa.s)	100-250
Amine Value³ (mg KOH/g)	310-350
Specific Gravity @ 21°C	1.01
Equivalent Wt/{H}	90
Recommended Use Level⁴ (PHR)	48

TYPICAL HANDLING PROPERTIES⁴

Gel Time⁵ (150g mix at 25°C) [mins]	95
Thin Film Set Time⁶ 25°C [h]	6.0/7.5
Mix Viscosity @ 25°C [mPa.s]	2000
Shore D Hardness (24h/7days)	76/79
Typical cure schedule	2-7 days

Footnotes:

- (1) ASTM D 1544-80
- (2) Brookfield RVTD, Spindle 4
- (3) Perchloric Acid Titration
- (4) With Bisphenol A diglycidyl ether (EEW=190)
- (5) Techne GT-3 Gelation Timer
- (6) BK Drying Recorder Phase II/III

SUPPLEMENTARY DATA

Ancamine 2685 curing agent was specifically developed for excellent UV stability over time while in addition offering low viscosity and long pot life for improved handling. These product features are particularly appreciated in hot climate conditions; in applications including stone carpet and semi-industrial flooring; and for use in industrial environment where aesthetic are required. Attached below is a technical bulletin that outlines several product features of Ancamine 2685 curing agent in addition to basic start point formulations for use in clear topcoats, white topcoats and self-levelling floor systems.

UV DURABILITY

Coatings based on Ancamine 2685 curing agent provide excellent UV stability over time, when compared to incumbent cycloaliphatic amine curing agents. This is demonstrated in Figure 1 where the yellowing index was measured as a function of exposure time. Yellowing was determined following ASTM E313, which describes the yellowing index as a 1-dimensional evaluation of the lightness-yellowness of the material colour. Further, yellowing of the coatings was determined following ASTM G154 and D4587-05, with main difference that no condensation cycle was applied (UV mode only). Clear coats were applied onto S-36i panels (Q Panel Lab Products) at using a 100 μ wire-bar and left to cure for 14 days prior to testing.

FIGURE 1: YELLOWING INDEX OVER TIME OF COATINGS BASED ON ANCAMINE 2685 CURING AGENT MIXED WITH EPODIL 748 REACTIVE DILUENT DILUTED BIS-A/F EPOXY RESIN (UV MODE ONLY)

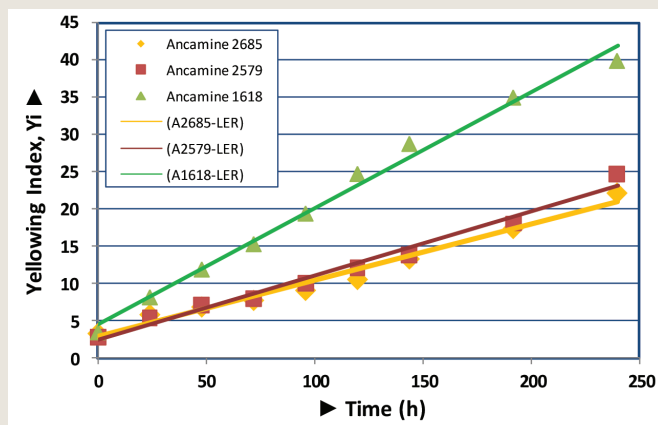
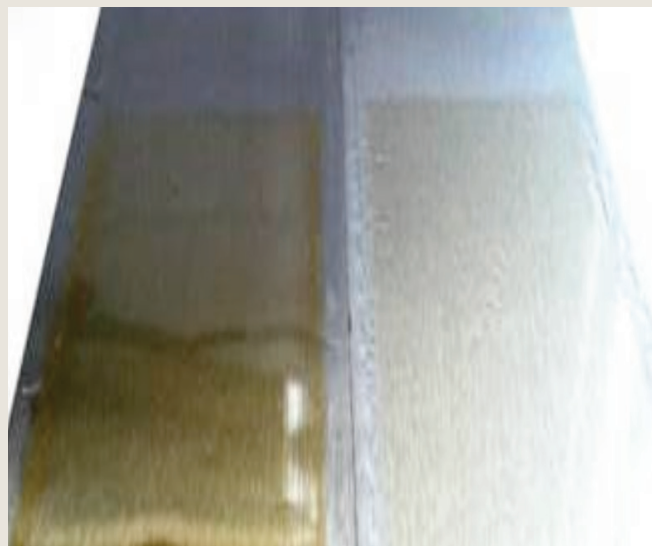


FIGURE 2: COMPARISON OF THE UV-EXPOSED PANEL AFTER 250 HOURS; ANCAMINE 1618 CURING AGENT (LEFT), ANCAMINE 2685 CURING AGENT (RIGHT)

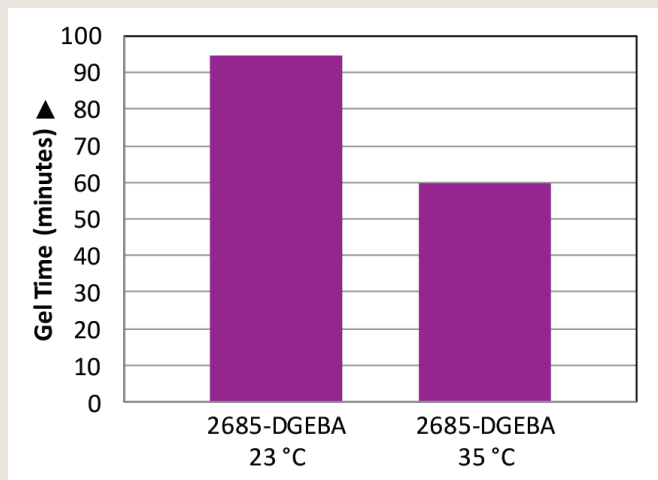


CURING AGENT CHARACTERISTICS

Handling properties

Ancamine 2685 curing agent exhibits low viscosity thus enabling lower mix viscosity compared to many conventional cycloaliphatic curing agents. In addition it offers a loading just below 50 PHR (parts per hundred resin) when used with liquid epoxy resins with an epoxy equivalent weight, EEW, of 190. Another feature of Ancamine 2685 curing agent is the very long pot life with liquid epoxy resin. Figure 3 represents the gelation time of 150 gram mixtures of Ancamine 2685 curing agent and bisphenol-A diglycidyl ether (DGEBA), EEW 190 at 48 PHR, using a Techne GT3 Gelation Timer, equipped with disposal glass plungers (22x5 mm) and operating at one cycle per minute. At 35 oC temperature, Ancamine 2685 curing agent still shows a long workable pot life of 60 minutes. This makes Ancamine 2685 curing agent an excellent choice for application in hot climates including for formulations with high filler loadings such as screeds and stone carpets.

FIGURE 3: GELATION TIME OF ANCAMINE 2685 CURING AGENT MIXED WITH LIQUID EPOXY RESIN, EEW190 AT 23°C AND 35°C



Choice of reactive diluent

Reactive diluents are generally used to improve handling properties of the epoxy resin. Depending on factors including the level of diluents used and the choice of curing agent, the chemical nature of the diluent may have a significant impact to aesthetics and performance. Figures 4 and 5 below show the effect of using an unmodified standard epoxy resin (DGEBA) in comparison to bis-A/F epoxy resins diluted with hexanediol diglycidyl ether (HDDGE) and the glycidyl ether of C12-C14 alcohol (Epodil® 748 reactive diluent). Coatings were applied with a 75 µ Bird applicator onto uncoated, matte paper charts (AG5350, Byk) and gloss was measured following ISO 2813 standard.

Coatings and castings based on Ancamine 2685 curing agent show high gloss when using Epodil 748 reactive diluent. With unmodified resin and HDDGE diluted resins, however, low gloss coatings resulted, which displayed a certain incompatibility (HDDGE). The preferred resin of choice with Ancamine 2685 curing agent is therefore an epoxy resin diluted with the glycidyl ether of C12-C14 alcohol, though other reactive diluents not tested here may work as well, depending on their chemical nature and usage level.

FIGURE 4: APPEARANCE OF CLEAR COATS FOLLOWING 15 MINUTES INDUCTION TIME. ANCAMINE 2685 CURING AGENT WAS MIXED WITH DGEBA, EEW190 (BOTTOM); BIS-A/F EPOXY RESIN DILUTED WITH HDDGE, EEW175, η 700 MPA.S (MIDDLE); AND (TOP) BIS-A/F EPOXY RESIN DILUTED WITH EPODIL 748 REACTIVE DILUENT, EEW195, η 900 MPA.S

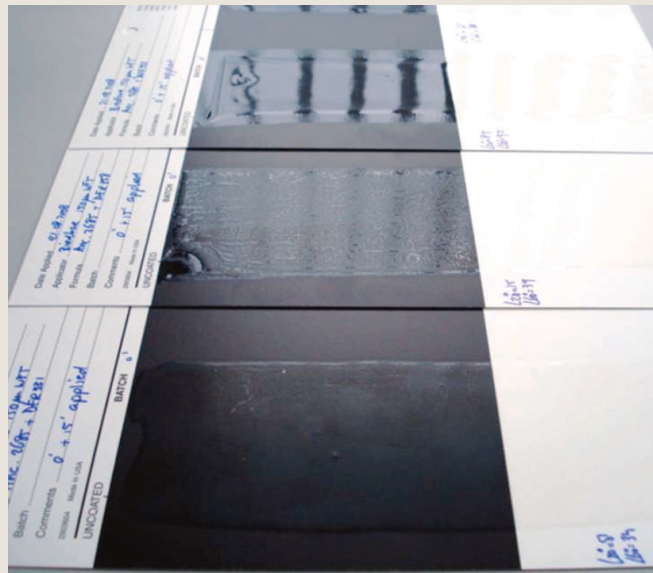
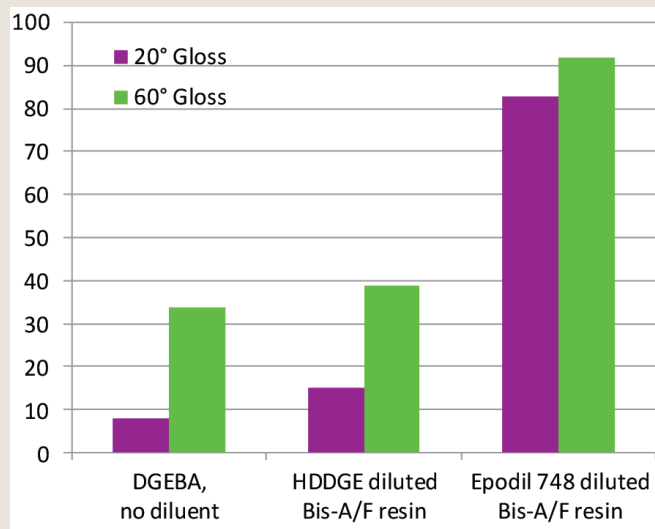


FIGURE 5: SPECULAR GLOSS (20° AND 60°) OF CLEAR COATS OF FIGURE 4



Additives for improving surface appearance and leveling

Coatings and castings based on Ancamine 2685 curing agent mixed with Epodil 748 reactive diluent diluted bis-A/F epoxy resin showed improved performance when using additives for surface appearance and leveling. This is illustrated in Figure 6 below. A coating based on 2685 curing agent recovered from picture framing and poor wetting defects (left) to result a high gloss coating (right) by use of additives such as Byk® 348 and Byk 333 (Byk Chemie). In order to eliminate additive incompatibility issues, it is important to mix the additive with epoxy resin for 15 minutes, preferably using a blade mixer. Coatings were applied with a 75 µ Bird applicator onto uncoated, matte paper charts (AG5350, Byk).

FIGURE 6: APPEARANCE OF 75 µ CLEAR COATS APPLIED WITHOUT ADDITIVES (LEFT) AND USING A LEVELING ADDITIVE (RIGHT), FOLLOWING A 10 MINUTES INDUCTION TIME. ANCAMINE 2685 CURING AGENT WAS MIXED AT 48 PHR WITH A BIS-A/F EPOXY RESIN DILUTED WITH EPODIL® 748, EEW195, µ 900 MPA.S



START POINT FORMULATION GUIDELINE — GLOSS CLEAR COATING

A-Component			Clear Topcoat
1. Epoxy resin	Bis-A/F epoxy resin diluted with Epodil 748 reactive diluent, EEW200, η 700 mPa.s	Various	99.80
2. Levelling agent	Byk® 348	Byk Chemie	0.20
			100.0
A-Component Manufacturing Procedure			
• Charge components 2 and stir for 15 minutes at low shear			
B-Component			
3. Curing agent	Ancamine 2685 curing agent	Evonik	48.00
TOTAL			100.0
After mixing Part A and B the formulation is ready to apply.			

START POINT FORMULATION GUIDELINE — GLOSS WHITE COATING

A-Component		Gloss White Coating	
1. Epoxy resin	Bis-A/F epoxy resin, EEW175; η 6,500 mPa.s	Various	36.70
2. Reactive Diluent	Epodil® 748 reactive diluent	Evonik	5.50
3. Defoamer	Byk® 057	Byk Chemie	0.30
4. Titanium dioxide	Tiona® 595	Millennium Chem.	31.40
5. Barium sulphate	Blanc Fix Micro®	Sachtleben Chemie	5.20
6. Levelling Agent	Byk 333	Byk Chemie	0.20
7. Defoamer	Byk 057	Byk Chemie	0.20
			79.50

A-Component Manufacturing Procedure

- Charge components 1-3 and mix until homogeneous at low shear
- Charge components 4-5, mix until homogeneous at low shear; then grind pigments at high speed (10-20 m/s) upto 40°C to yield particle size less then 10 μ
- Reduce speed and add component 6-7 and mix until homogeneous for another 15 minutes at low shear

B-Component			
8. Curing agent	Ancamine 2685 curing agent	Evonik	20.50
TOTAL			100.0

After mixing Part A and B the formulation is ready to apply. Additional modification for improved appearance may be desired.

TECHNICAL DATAL

Calculated Data		
- Solids	Weight-%	100
- Density, Part A	g/ml	1.7
- Mix ratio by weight		79:21
- Mix ratio by volume		70:30
- PVC		13.1
Mix Viscosity	mPa.s	1200
Dry-to-Handle Time, Thumb-Twist Method (ASTM D1640)	h	< 16
Gloss	20° / 60°	95 / 100
Persoz Hardness	24 h	60
	48 h	155
	7 d	250

ANCAMINE® 2685 Curing Agent**START POINT FORMULATION GUIDELINE — LIGHT GREY SELF-LEVELLING FLOOR**

A-Component		Grey Self-Levelling Floor	
1. Epoxy resin	DGEBA, EEW190, η 11-14 Pa.s	Various	33.50
2. Reactive Diluent	Epodil® 748 reactive diluent	Air Products	6.70
3. Defoamer	Byk® A530	Byk Chemie	1.00
4. Titanium dioxide	Kronos® 2160	Kronos International	5.00
5. Iron oxide black	Bayferrox® 318M	Bayer	0.10
6. Barium sulphate	Barytpowder F	Sachtleben Chemie	53.70
			100.00

A-Component Manufacturing Procedure

- Charge components 1-3 and mix until homogeneous at low shear
- Charge components 4-6, mix until homogeneous at low shear; then grind pigments at high speed (10-20 m/s) upto 40°C to yield particle size less than 30 μ
- Reduce speed and allow to cool-down to room temperature

B-Component			
7. Curing agent	Ancamine 2685 curing agent	Evonik	18.00
C-Component			
8. Filler	Quartz sand 0.1-0.3 mm	Sibelco	100.00
TOTAL			218.00

For application, first mix part A and B for 3-5 minutes ensuring a homogeneous mixture is obtained; then mix in Part C and mix for additional couple of minutes. After mixing Part A, B and C, the formulation is ready to apply. Additional modification for improved appearance may be desired.

TECHNICAL DATA

Gloss	20° / 60°	45 / 85
Hardness Shore D	24 h	52D
	48 h	72D
	7 d	78D

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