Epoxy Curing Agents and Modifiers

ANCAMINE® 2609 Curing Agent

DESCRIPTION

Ancamine 2609 curing agent is a nonyl phenol free aliphatic polyamine Mannich base curing agent designed for use with liquid epoxy resin. It is of low viscosity, extremely moisture tolerant and highly reactive at low temperatures ~5°C. Ancamine 2609 will react with liquid epoxy resins at low temperature and high humidity to produce a highly chemical resistant surface coating.

ADVANTAGES

- Moisture tolerant
- Fast Cure
- Low Temperature cure
- Excellent Chemical resistance

APPLICATIONS

- Protective coatings
- Industrial applications
- Moisture tolerant coatings

SHELF LIFE

At least 24 months from the date of manufacture in the original sealed container at ambient temperature. Store away from excessive heat and humidity in tightly closed containers. Do not freeze.

STORAGE AND HANDLING

Refer to the Safety Data Sheet for Ancamine 2609 curing agent.

TABLE 1: TYPICAL PROPERTIES

Appearance	Clear straw colored liquid
Color[1] (Gardner)	3
Viscosity[2] @ 25°C, [mPa.s]	350
Amine Value[3], [mg KOH/g]	400
Specific Gravity @ 21°C, [g/ml]	1.01
Equivalent Wt/{H}	75
Recommended use Level[4], [PHR]	40

TABLE 2: TYPICAL HANDLING PROPERTIES [@ 40PHR]

Mix Viscosity 25°C [mPa.s]	1750
Gel Time[5] (150g mix at 25°C), [mins]	15
Thin Film Set Time[6] 25°C, [h]	2

TABLE 3: TYPICAL PERFORMANCE PROPERTIES

Tensile Strength[7], [MPa]	46
Tensile Modulus[7], [GPa]	7.6
Tensile Elongation at Break [%]	0.7
Flexural Strength[8], [MPa]	74
Flexural Modulus[8], [GPa]	3.6

Footnotes:
(1) ASTM D 1544-80
(2) Brookfield RVTD, Spindle 4
(3) Perchloric Acid Titration
(4) Theoretical value with Bisphenol A diglycidyl ether (EEW=190)
(5) Techne GT-3 Gelation Timer
(6) BK Drying Recorder Phase III
(7) ISO 527
(8) ISO 178

SUPPLEMENTARY INFORMATION

Ancamine 2609 is a nonyl phenol and phenol free Mannich base curing agent exhibiting low viscosity, fast drying and rapid property development under adverse conditions.Ancamine 2609 can be used as a sole curative or as an accelerator in combination with other curing agents to produce solvent free and high solids coatings systems for a variety of applications. As a sole curative it is highly effective in applications which require a fast return to service, such as repair compounds. Whereas, in combination with polyamides, Ancamine 2609 is a very effective amine accelerator to improve cure speed and physical properties with minimum effect on embrittlement and overcoatablity.

The raw materials used in Ancamine 2609 are compliant with the Synoptic document and are listed in the German KTW Regulations (Part I), which is a requirement for food contact or potable water applications.

MIXED VISCOSITY

Ancamine 2609 exhibits a steep viscosity reduction profile when mixed with liquid epoxy resin. Despitea higher neat viscosity when compared to Ancamine 2089M the mixed viscosity of Ancamine 2609 with an epoxy resin is very similar.

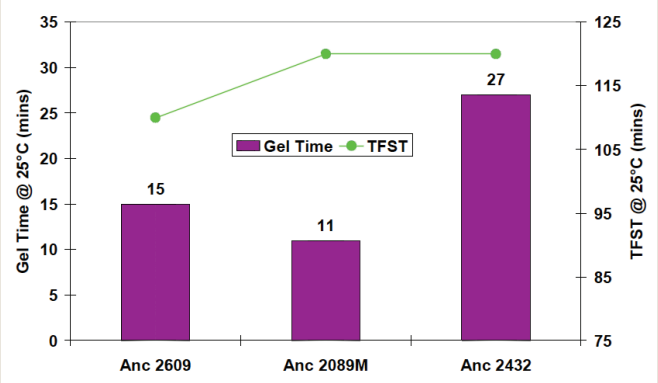
	PHR	Viscosity (curing agent) @ 25°C	Mixed Viscosity @ 25°C
Ancamine 2609	40	350 mPa.s	1750 mPa.s
Ancamine 2089M	40	100 mPa.s	1450 mPa.s

These values are obtained with a standard Bisphenol-A epoxy resin (DGEBA, EEW=190) using the recommended PHR of 40.

CURE SPEED AND POT LIFE

Ancamine 2609 demonstrates an excellent balance of cure speed and pot life, with a gel time of 15 minutes and a thin film set time of under 2 hours at 25°C this gives a very good workable pot-life with an excellent dry time.

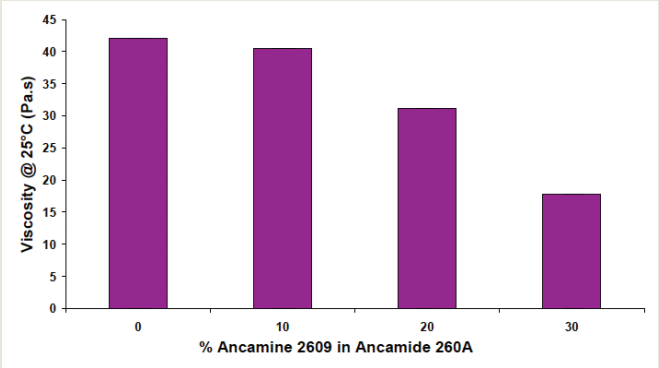
FIGURE 1: GEL TIME AND THIN FILM SET TIME @ 25°C FOR SELECTED SYSTEMS



WHEN USED AS AN ACCELERATOR

Mannich base technology is widely used as a co-curing agent with polyamides to improve low temperature cure, reduce viscosity and increase reaction rate. The following figure shows the reduction in viscosity of Ancamide 260A, which is a standard polyamide curing agent used in coatings, with increased addition of Ancamine 2609.

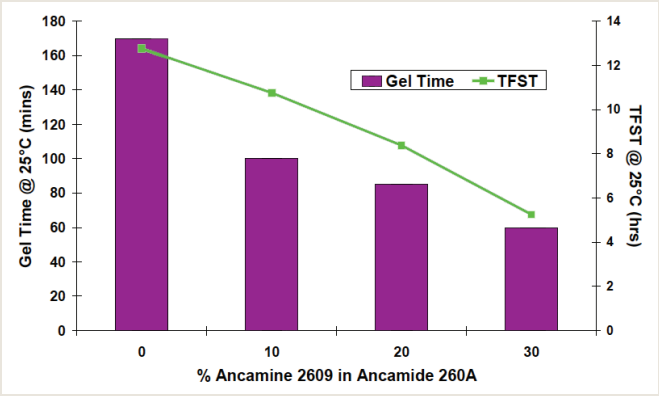
FIGURE 2: VISCOSITY OF BLENDS OF ANCAMINE 2609 WITH ANCAMINE 260A @ 25°C



The viscosity can be halved with the inclusion of 30% Ancamine 2609.

The following figure shows the effect of Ancamine 2609 on cure speed and physical properties when blended with polyamide Ancamide 260A and cured with a standard Bisphenol-A epoxy resin.

FIGURE 3: GEL TIME AND THIN FILM SET TIME @ 25°C FOR BLENDS OR ANCAMINE 2609 WITH ANCAMINE 260A



ANCAMINE® 2609 Curing Agent

The following table shows the Persoz hardness development with time for coating systems made with blends of Ancamide 260A and Ancamine 2609.

	Ancamide 260A	Ancamide 260A + 10% Ancamide 2609	Ancamide 260A + 20% Ancamide 2609	Ancamide 260A + 30% Ancamide 2609
1 Day	75	95	155	315
3 Days	100	135	195	335
7 Days	115	210	280	360

These results are for films of 150;m cured at 25°C with a standard Bisphenol-A epoxy resin. With 30% addition of Ancamine 2609 there is a dramatic effect on the hardness development and the ultimate hardness after 7 days. This effect of increasing hardness development is a clear indication of increased cure rate and crosslink density, this has the effect of increasing the physical strength of the cured system and also increasing the chemical resistance.

EVONIK CORPORATION
7201 Hamilton Blvd.
Allentown, PA 18195
1 800 345-3148
Outside U.S. and Canada 1 610 481-6799

For Technical Information and Support:
Americas: picus@evonik.com
EMEA: apcse@evonik.com

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