



PRODUCT DATA SHEET

PRELIMINARY DATASHEET NACURE[®] XC-9206 CATALYST

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INTRODUCTION: NACURE[®] XC-9206 is a metal complex catalyst for crosslinking of epoxy/carboxylic functional resins. NACURE XC-9206 catalyzes the reaction of glycidyl ether, ester, cycloaliphatic epoxies and epoxidized oils with carboxyl and anhydride groups. NACURE XC-9206 provides excellent storage stability. Compared to amine catalyzed formulations, NACURE XC-9206 gives films with improved humidity and corrosion resistance, flexibility and resistance to yellowing.

ADVANTAGES: Non-amine catalyst for epoxy/carboxyl or anhydride crosslinking
Improved adhesion and corrosion resistance
Better water resistance
Non yellowing
Improved storage stability of catalyzed formulations
Can also catalyze amino resin crosslinking

TYPICAL PROPERTIES:

Appearance	Tan, clear liquid
Nonvolatile, 60 min. 110°C, %	78
Solvent	Aliphatic hydrocarbon
Viscosity, 25°C, cps	200
Metal content, %	10
Flash point, Seta Flash	>50°F
Weight per gallon, 25°C, pounds	8.9
Specific gravity, 25°C, g/ml	1.07

SOLUBILITY:	Acetone, methyl ethyl ketone	Not soluble
	Methyl isobutyl ketone	Soluble
	Alcohols, IPA, butanol	Soluble
	Esters	Soluble
	Glycol ether (2-butoxyethanol)	Soluble
	Aliphatic and aromatic hydrocarbons	Soluble
	Water	Not Soluble

COMPATIBILITY: Compatible with bisphenol A and F diglycidyl ether, cycloaliphatic epoxies, epoxidized oils, acrylic and polyester resins

APPLICATION: Catalyst for automotive clearcoats, can coating and coil coating primers
For cure temperatures above 120°C (250°F)

USAGE LEVEL: 0.3-3.0% on total resin solids

HANDLING: Consult the MSDS for safe handling. Product may crystallize if stored below 0°C
Do not store above 50°C for prolonged periods of time.

REGULATORY: Please refer to Section 15 of the Material Safety Data Sheet for information.

CLEAR ACRYLIC/EPOXY FORMULATION
CARBOXY FUNCTIONAL ACRYLIC & BISPHENOL A EPOXY

Materials	Weight %
Acrylic resin, carboxy functional, equivalent weight on solids = 1150 (75.8% Nonvolatile in xylene / n-butanol)	40.4
Epon 1001 (100 % solids, epoxy equivalent weight = 538)	17.9
Flow and leveling agent	0.2
2-Methoxypropyl acetate	39.5
Aromatic 100	2.0
Catalyst	See table
Total	100.0

APPLICATION CONDITIONS AND TEST RESULTS

Cure conditions: 6 minutes at 400 °F (204°C)
Substrate: Tin free plate
Dry film thickness: 0.15 mil
Catalyst addition: Based on resin solid

Catalyst	Catalyst %	Gloss 20° %	Gloss 60° %	Pendulum hardness (sec)	Flexibility T-bend
No catalyst	0	55	95	141	>5
NACURE XC-9206	0.25	95	100	187	>5
NACURE XC-9206	0.5	95	100	194	0
NACURE XC-9206	1.0	95	100	193	0
NACURE XC-9206	1.5	95	100	193	0
NACURE XC-9206	2.0	95	100	203	0
2-Ethylimidazole	0.5	95	100	191	0
Amine ADMA-10	0.5	95	100	190	>5
Phosphonium salt*	0.5	95	100	187	0

* ETPPI is an ethyl triphenyl phosphonium iodide catalyst.

HUMIDITY and BOILING WATER RESISTANCE

Boiling water test: The panels with direct and reverse impact of 80 inch.lb were immersed in boiling water.

Catalyst	Catalyst	Cleveland condensing Humidity 45 °C , 168 hrs.		Boiling water test 60 minutes
		Gloss 20° %	Gloss 60° %	Appearance after test
No catalyst	0	*	*	Destroyed
NACURE XC-9206	0.25	*	*	Destroyed
NACURE XC-9206	0.5	95	100	No change
NACURE XC-9206	1.0	97	100	No change
NACURE XC-9206	1.5	95	100	No change
NACURE XC-9206	2.0	95	100	No change
2-Ethylimidazole	0.5	98	100	No change
Amine ADMA-10	0.5	43	90	Micro blister
Phosphonium salt	0.5	90	100	No change

* Failed Humidity test after 48 hours, low gloss, boiling water test film destroyed

STORAGE STABILITY OF CATALYZED FORMULATIONS

	Catalyst level, %	Viscosity, ICI 25°C Poise 4 weeks at room temperature	Viscosity, ICI 25°C Poise 3 weeks at 50 °C
No catalyst	0	1.15	1.15
NACURE XC-9206	0.5	1.15	2.5
NACURE XC-9206	1.0	1.9	2.5
NACURE XC-9206	1.5	1.9	3.4
NACURE XC-9206	2.0	1.9	3.7
2-Ethylimidazole	0.5	4.7	gelled after 4.5 days
Amine ADMA-10	0.5	3.7	gelled after 8.5 days
Phosphonium salt*	0.5	3.5	gelled after 5.5 days

WHITE CAN COATING FORMULATION

Grind:

	Parts by weight
Acrylic resin, carboxy functional, Equivalent weight on solids = 1150 75.8% Nonvolatile in xylene / n-butanol)	8.6
2-Methoxypropyl acetate	14.0
Aromatic 150 solvent	1.4
Ti-Pure R-900 Rutile titanium dioxide	28.4

Let down:

Acrylic resin, carboxy functional, Equivalent weight on solids = 1150 75.8% Nonvolatile in xylene / n-butanol)	20.3
Epon 1001bisphenol epoxy resin(100 % solids EW= 538)	12.8
2-Methoxy propyl acetate	14.3
Flow and leveling agent	0.2
Catalyst	varies
Total	100

APPLICATION CONDITIONS AND TEST RESULTS

Cure conditions: 6 minutes at 400 °F, (204°C)

Substrate: Tin free plate

Dry film thickness: 0.2 mil

Film was applied after storage of the formulation for one week at room temperature.

Catalyst	Catalyst level, %	Gloss 20° %	Gloss 60° %	Pendulum hardness (sec)	Flexibility T-bend
No catalyst	0	60	76	115	>5
NACURE XC-9206	0.56	65	80	140	>5
NACURE XC-9206	0.85	70	80	132	0
NACURE XC-9206	1.28	75	90	152	0
NACURE XC-9206	1.70	83	94	162	0
NACURE XC-9206	2.00	83	95	163	0
2-Ethylimidazole	0.85	82	92	152	0
Amine ADMA-10	0.85	78	92	140	4
Phosphonium salt	0.85	85	95	140	0

BOILING WATER TEST

Boiling water test: Panels with a direct and reverse impact at 80 inch-pound were immersed in boiling water for one hour.

Catalyst	Catalyst level, %	Film Appearance after boiling water test
No catalyst	0	Flat gloss, medium dense blister
NACURE XC-9206	0.56	no change
NACURE XC-9206	0.85	no change
NACURE XC-9206	1.28	no change
NACURE XC-9206	1.70	no change
NACURE XC-9206	2.0	no change
2-Ethylimidazole	0.85	no change
AmineADMA-10	0.85	peeling on indirect impact some loss in gloss
Phosphonium salt	0.85	no change

PERFORMANCE AT HIGHER FILM THICKNESS

Cure conditions: 6 minutes at (204 °C) 400 °F
Substrate: Cold rolled steel degreased
Dry film thickness: 1.0 mil (25 micron)
Film was applied after aging of the formulation for one week at room temperature

Catalyst	Catalyst level, %	Gloss 20°, %	Gloss 60°, %	Pendulum hardness (sec)	Impact resistance direct/reverse inch.pound
NACURE XC-9206	0.85	90	95	129	60 / <5
NACURE XC-9206	1.70	90	97	129	110 / 20
NACURE XC-9206	2.00	91	96	130	160 / 130
2-Ethylimidazole	0.85	90	96	140	160 / 160
Amine ADMA-10	0.85	85	95	122	60 / <5
Phosphonium salt ETPPI	0.85	78	93	130	60 / <5

RESISTANCE TO YELLOWING

Cure conditions: 6 minutes at 204°C (400 °F)
Substrate: Cold rolled polished panels
Dry film thickness: 1.0 mils (25 micron)
Film was applied after aging of the formulation for one week at room temperature

Catalysts	Catalyst level, %	b value after cure at 400 °F for 6 minutes
NACURE XC-9206	0.85	-1.71
NACURE XC-9206	1.70	-1.70
NACURE XC-9206	2.00	-1.70
2-Ethylimidazole	0.85	2.26
Amine ADMA-10	0.85	-1.13
Phosphonium salt	0.85	-0.18

SALT SPRAY RESISTANCE (ASTM B-117)

Cure conditions: 6 minutes at 400 °F (204°C)
Substrate: Cold rolled polished panels
Dry film thickness: 1.0 mils (25 micron)
Film was applied after aging of the formulation for one week at room temperature.

Catalysts	Catalyst level, %	Salt spray ASTM B-117 327 hours mm creep, blister
NACURE XC-9206	0.8-2.0	3.0, 10
2-Ethylimidazole (0.85%)	0.85	4.0-6.0, 10
Amine ADMA-10	0.85	4.0-4.5, 10
Phosphonium salt	0.85	4.0, 10

NACURE XC-9206 IN GMA EPOXY/ CARBOXYLIC ACID ACRYLIC

NACURE XC-9206 catalyzes the reaction between glycidyl ester functional acrylic resin and a carboxylic acid while improving the corrosion resistance. Compared to the 2-ethylimidazole, the NACURE XC-9206 gives longer storage stability of the formulation without impairing other physical properties. However, due to the high reactivity of the glycidyl ester, the gain in cure response is lower than with a bisphenol A type epoxy. Furthermore, a higher concentration of catalyst is necessary to activate the reaction.

Formulation

Parts by Weight

	NACURE XC-9206 2.4 % on binder	2-ethylimidazole 0.48 % on binder	No Catalyst -----
Joncryl 819	20.0	20.0	20.0
Xylene	27.0	27.0	27.0
2-Methoxypropyl acetate	27.0	27.0	27.0
FINE-CLADE A-207-SA	13.0	13.0	13.0
n-butyl acetate	13.0	13.0	13.0
Subtotal	100.0	100.0	100.0
NACURE XC-9206	0.79	-----	-----
2-ethylimidazole	-----	0.16	-----
Nonvolatile, %	33.0	33.0	33.0
Initial viscosity, 25°C,cps	705	720	920
Heat aged 30 min. 100 °C, cps	1,050	1,050	980
Gel time at 50 °C	6 days	3.5 days	10 days

PROPERTIES

Substrate: Bonderite pretreated 1000 panels
Dry film thickness: 0.6 mil (15 micron)

	NACURE XC-9206	2-ethylimidazole	no catalyst
Baking condition	15 min. 140 °C	15 min. 140 °C	15 min.160 °C
Catalyst concentration	2.4% on TRS*	0.48% on TRS	-
Methyl ethyl ketone (2x)	>200	>200	>200
Pendulum hardness, seconds	190	195	189
Adhesion	10	10	10
Impact resistance			
Direct/Indirect, inch.lb	160 / <5	160 / <5	160 / <5
Gloss, 20°/60°, %	80.0/100	80.0/100	80.0/100
CLEVELAND HUMIDITY RESISTANCE, 800 HOURS, 20° gloss, %	70	72	75.5
Salt spray resistance B-117			
424 hours exposure			
mm creep, blister	2.5 ,Few No 2	2.5, Few No 2	3.5, Few No 2
700 hours exposure			
mm creep, blister	3.5, Few		6.0, Few
*TRS Total resin solids			

Product guide

Acrylic resin carboxy functional is a model compound free of any internal amine catalyst.

ETPPI, Ethyltriphenylphosphonium iodide catalyst

ADMA-10, Decyldimethylamine

Epon 1001, Bisphenol A based glycidyl resin (Epoxy equivalent weight 538) from Shell Chemical Company, Houston TX.

FINE-CLADE A-207-SA is a 100 % solids glycidyl methacrylate functional acrylic resin with an epoxy equivalent weight of 490, from Reichhold Chemical.

Joncryl 819 is a carboxyl functional acrylic resin with an acid number of 75, 100 % solids from SC Johnson

Ti-Pure 900 is a product of Dupont de Nemours Wilmington Delaware.