

ERISYS GE-60 as a Cross Linker for Acid Functional Acrylic Solution Resin

Summary:

ERISYS GE-60 was evaluated in two high gloss enamel starting point formulations 17-0884-A and 10-0509-B. Both formulations used ERISYS GE-60 cut in appropriate solvent as part of a two part coating system. Panels were sprayed and air dried for seven days then tested for corrosion resistance under salt spray, chemical resistance to MEK rub, and retention of gloss under QUV exposure. The data presented shows ERISYS GE-60 to be an effective cross linker in both systems with the best performance exhibited by chemical 17-0884.

Starting Formulations:

High Gloss N1S0 White Acrylic/Epoxy Enamel

Part A of Formulation 17-0884-A

(Grind Paste Portion)

<u>FORMULATION</u>	<u>POUNDS</u>	<u>GALLONS</u>
CHEMPOL® 17-0884 ⁽¹⁾	77.89	9.53
PM Acetate	29.45	3.65
Methyl amyl ketone	29.45	4.33
Disperbyk® 163 ⁽²⁾	7.78	0.93
Coroc® A-620-A2 ⁽¹⁾	0.47	0.06
TiPure R-960 ⁽³⁾	280.49	8.68

Pebble grind with zircoa beads to Hegman 7 1/2+ and let down with:

<u>FORMULATION</u>	<u>POUNDS</u>	<u>GALLONS</u>
CHEMPOL 17-0884	330.87	40.50
Butyl Cellosolve	14.00	1.86
Coroc A-620-A2	2.80	0.35
PM Acetate	27.99	3.47

Part B* of Formulation 17-0884-A

<u>FORMULATION</u>	<u>POUNDS</u>	<u>GALLONS</u>
ERISYS GE-60 ⁽⁴⁾	30.79	2.82
N-Butyl Acetate	174.95	23.80

*To be added and mixed into Part A immediately prior to using

⁽¹⁾ CCP, Polymers Division

⁽²⁾ BYK-Chemie, USA

⁽³⁾ DuPont

⁽⁴⁾ CVC Specialty Chemicals

ERISYS GE-60 as a Cross Linker for Acid Functional Acrylic Solution Resin**PROPERTIES:**

Weight solids, %	55.81
Volume solids, %	39.77
PVC, %	21.8
P/B wt. ratio	1.0
NVM, 1 hour/110°C,%	55.28
Actual VOC	
Pounds/Gallon	4.55
Grams/Liter	545
Viscosity, #3 ZAHN Cup, seconds	17
Pot-life to 2x viscosity, hours	4 – 6

CURE:

Spray was applied to B 1000 CRS and air dried for 7 days before evaluation.

High Gloss White Acrylic/Epoxy Enamel**Part A of Formulation 10-0509-B**

(Grind Paste Portion)

<u>FORMULATION</u>	<u>POUNDS</u>	<u>GALLONS</u>
CHEMPOL® 10-1744 ⁽¹⁾	45.9	5.5
SURFYNOL® 104BC ⁽²⁾	1.8	0.2
Dipropylene glycol monobutyl Ether	6.4	0.8
28% ammonium hydroxide	3.7	0.5
Deionized water	68.8	8.3
TiPure® R-960 ⁽³⁾	172.1	5.3

Pebble grind with zircoa beads to Hegman 7 ½ and add:

Deionized water 20.2 2.4
 And blend until homogenous

Let down Grind Paste (above) with Premix Blend (below).

Mix until homogenous.

<u>FORMULATION</u>	<u>POUNDS</u>	<u>GALLONS</u>
CHEMPOL 10-0509 ⁽¹⁾	153.5	17.9
SURFYNOL 104BC ⁽²⁾	3.4	0.5
COROC A-2678M ⁽¹⁾	6.9	0.8
N,N-Dimethylethanolamine	0.9	0.1
28% ammonium hydroxide	10.3	1.4
Triethylenediamine ⁽²⁾	0.9	0.1
Butyl Cellosolve	2.6	0.3
Deionized Water	377.8	45.3

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Part B* of Formulation 10-0509-B

(Epoxy Portion)

<u>FORMULATION</u>	<u>POUNDS</u>	<u>GALLONS</u>
ERISYS GE-60 @ 83% NV in Acetone	41.4	4.3
Deionized water, for viscosity adjustment	<u>62.3</u> 979.0	<u>7.5</u> 101.1

*To be added and mixed into Part A immediately prior to spraying.

(1) CCP, Polymers Division

(2) Air Products

(3) DuPont

(4) CVC Specialty Chemicals

PROPERTIES:

Weight solids, %	35.81
Volume solids, %	22.4
VOC, calculated less water	
Pounds/Gallon	2.37
Grams/Liter	284
P/B wt. Ratio	0.98
PVC, %	22.4
pH	8.25
Index-epoxy/COOH	
Equivalent	0.75
Dry – 3 mils wet over glass 78°F @ 55% RH	
Set to touch, minutes	0:20
200 gram Zapon, hours	2:00
500 gram Zapon, hours	3:00

CURE:

Spray was applied to B 1000 treated CRS. Coating air dried for 10 days prior to testing.

Results:

COATING PROPERTIES

TESTS	17-0884-A	10-0509-B
Vis., #4 Ford, seconds	----	38
Vis., #3 Zahn, seconds	14	----
PH	----	8.25
Wt./Gal., Lbs.	10.21	9.68
NVM, %	57.16	34.92
DFT, mils	5.0	2.1
MEK DR'S	200+, softens	200+, softens
X-hatch Adhesion, %	100	100
Pencil Hardness	H	F
Reverse Impact, in #'s	<5	<5
Direct Impact, in #'s	10	20

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Salt Spray Exposure (hr)	17-0884-A	10-0509-B
168	Rust in Scribe	Rust in Scribe
336	Rust in Scribe, Light Staining About Scribe	Rust in Scribe, Light Staining about Scribe, Few #8 Blisters about Scribe
504	Rust in Scribe, Light Staining about Scribe, Med. Dense #8 Blisters in Scribe	Rust in Scribe, Light Staining about Scribe, Dense #8 Blisters About Scribe
672	Rust in Scribe, Light Staining about Scribe, Dense #8 & #6 Blisters in Scribe	Rust in Scribe, Light Staining about Scribe, Dense #8 & #6 Blisters about Scribe
840	Rust in Scribe, Light Staining about Scribe, Dense #6 & #4 Blisters in Scribe	PULLED
1008	Rust in Scribe, Light Staining about Scribe, Dense #6, #4 & #2 Blisters in Scribe	

60° /20° GLOSS

Cleveland Humidity (hr)	17-0884-A	10-0509-B
Initial	90/79	90/75
168	90/79	90/75
336	90/78	88/73
504	88/77	89/74

60° /20° GLOSS

QUV 313B Exposure (hr)	17-0884-A	10-0509-B
Initial	88/78	84/67
90	87/74	88/63
166	88/72	79/40
232	86/68	67/20
333	87/69	53/9
588	82/55	13/3
668	83/51	
758	79/46	
900	76/43	
1001	69/31	
1256	46/12	
1418	41/10	

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Conclusion:

ERISYS GE-60 is an effective cross linker for acid functional acrylics. The cured resin blends provide good physical properties and UV resistance.