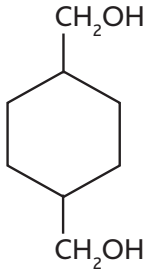
Water-reducible, polyester-melamine cross-linked coating

Based on Eastman™ CHDM-D



Eastman™ CHDM-D

Enamel prepared from polyester resin WS-3-2C

Features

- 57 wt% applied solids
- Excellent hardness
- Good detergent resistance
- Good stain resistance
- Good impact resistance

WS-3-2C resin formulation

Component[a]	Equivalents	Moles	Weight
Eastman™ CHDM-D	7.12	3.56	518
Trimethylolpropane	1.40	0.47	63
Phthalic anhydride	4.17	2.09	309
Adipic acid	2.78	1.39	203
		Total charge	1,093
		Water loss	–72
		Yield	1,021

No catalyst required.
Nitrogen flow adequate to maintain <1% oxygen.

[a] *Raw material suppliers listed on page 3*

Process conditions and resin properties

Up-heat rate, degree/min, from 30° to 200°C (86° to 392°F)	2
Reaction time, hours @ 200°C	2
Final acid value, mg KOH/g resin	45–55
Molecular weight, vapor pressure osmometry	600–800
Suggested dilution, % NV (see resin viscosity table)	85
Gardner™ color, 85% NV	<1
Weight/volume, 24°C (75°F), kg/L (lb/U.S. gal)	1.135 (9.48)
Final hydroxyl value	140–150

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Resin viscosity (Gardner scale)

	Resin solids, wt%	
Solvent[a]	85	80
Eastman™ *n*-butyl alcohol	Z_5–Z_6	Z–Z_1
Eastman™ EB (ethylene glycol monobutyl ether)	Z_7	Z_3–Z_4
Eastman™ DB (diethylene glycol monobutyl ether)	Z_7–Z_8	Z_5

[a]*Raw material suppliers listed on page 3.*

Enamel composition

Component	Weight	Solids
Grind[a]		
Resin WS-3-2C (85% NV)	258.0	219.3
Ti-Pure™ R-900 TiO_2	256.3	256.3
Hexamethoxymethylmelamine	94.0	94.0
Dimethylethanolamine (DMEA)	18.1	—
Fluorosurfactant flow additive	3.1	0.3
Letdown		
Demineralized water	354.0	—
Eastman™ *n*-butyl alcohol	16.5	—

[a]*Raw material suppliers listed on page 3.*

Enamel properties

Polyester/melamine ratio	70/30
Binder/pigment ratio	55/45
Nonvolatiles, wt%	57
Water/organic, wt%	82/18
pH	8.0–8.5
Viscosity, #4 Ford Cup, s	55–60

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Cured film properties[a,b]

Cure temperature/time, °C/min	177/20
Gloss, 60°	98
20°	83
Impact resistance, N·m (in.-lb)	
Direct	15.8 (140)
Reverse	10.2 (90)
Pencil hardness	4H
Solvent resistance, MEK double rubs	200+
Scribed adhesion, % pass	100
1/8 in. Conical mandrel flexibility (ASTM D522), % pass	100
Stain resistance (ASTM D3274)	5–10
Detergent resistance,[c] 1.5% standard detergent solution 240 h @ 74°C (165°F)	
60° Gloss retention, %	100
Blisters, frequency/size	None
Salt spray resistance, 500 h	
60° Gloss retention, %	100
Scribe creepage, mm (in.)	<0.8 (<1/32)
Blisters	None
Storage stability	
Initial: pH/viscosity, cP	8.3/320
After 500 h @ 120°F: pH/viscosity, cP	7.0/400

[a]*Unprimed, zinc phosphatized, cold-rolled steel panels coated with a 1–1½ mils (25.4–38.1 microns) film were used in these evaluations.*

[b]*Test methods are those commonly used in the polymers and coatings industry.*

[c]*Coatings were applied over an epoxy primer for detergent resistance tests.*

Raw material suppliers

Eastman™ CHDM-D	Eastman
Ethylene glycol monobutyl ether (Eastman™ EB solvent)	Eastman
Diethylene glycol monobutyl ether (Eastman™ DB solvent)	Eastman
Eastman™ *n*-butyl alcohol	Eastman
Ti-Pure™ R-900 TiO_2	DuPont
Hexamethoxymethylmelamine	Cytec
Trimethylolpropane	Geo Specialties, Perstorp
Phthalic anhydride	Stepan, Koppers
Adipic acid	DuPont

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