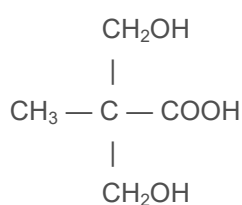


DMPA[®]

DMPA[®] Dimethylolpropionic Acid In Air Dry Water Soluble Alkyd Resins



CAS Number: 4767-03-7

DMPA[®] Dimethylolpropionic Acid is a trifunctional compound, having one tertiary carboxylic group and two primary hydroxyl groups attached to a central carbon.

Because of this neopentyl structure, compounds prepared from **DMPA[®]** exhibit good thermal, hydrolytic and colour stability.

Specifications

Property	Regular Grade
Hydroxyl Content, wt %	24.0 min
Neutralization Equivalent	141.0 max
Ash as Na ₂ O, wt %	0.03 max
Moisture, wt %	0.3 max
Water Insolubles, ppm	50.0 max
Colour, APHA	250 max

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The unique structure of **DMPA[®]** provides many advantages in the formulating of water soluble alkyd resins. The two primary hydroxyl groups allow for easy introduction into the alkyd polymer. The tertiary carboxyl group is essentially non-reactive during the cooking process and is later neutralized with an amine to provide water solubility.

DMPA[®] is easy to use as all ingredients may be charged to the alkyd kettle and processed at once; conventional alkyd equipment can also be employed.

The formulations given here will serve as starting points for the preparation of two air dry water soluble alkyds. One formulation has slightly less oil, but either one may be altered to suit your individual requirements. For a comparison, a water soluble alkyd was made from a formulation published by Amoco as WS-549 and is measured against the two GEO formulations: RD8876 & RD8878.

Table 1—Resin Preparation

	RD8876	RD8878
Sylfat [®] V-18 1	369	345
Monopentaerythritol	93	97
TRIMET [®] TME Trimethylolethane	113	117
Phthalic Anhydride	330	342
DMPA [®]	95	99

1 Gliddem Division SCM

Processing:

1. All ingredients are charged to the kettle and slowly heated to 200-205°C. The reaction is held at 200-205°C until the acid value is reduced to acid 45-50.
2. The reaction is then cooled to 150°C, and a 80 / 20 blend of Butyl Cellosolve / Isobutyl Alcohol is added to the resin to reduce the solids to 75%.

All information and data, including the formulations and procedures discussed herein, are believed to be correct. However, this should not be accepted as a guarantee of their accuracy, and confirming tests should be run in your laboratory or plant. No statement should be construed as a recommendation for any use which would violate any patent rights. Sales of all products are pursuant to terms and conditions included in GEO Specialty Chemicals sales documents. Nothing contained therein shall constitute a guarantee or warranty with respect to the products described or their use. Safety information regarding these products is contained in their Safety Data Sheets. Users of these products are urged to review and use this information.

REVISION DATE: OCTOBER 2020

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Table 1—Resin Characteristics

	Properties
Viscosity (Gardner)	Z5 - Z7
Colour, Gardner	8 max
Acid Value (AV), mgKOH /g	45 - 50
Non-volatile Matter (NVM), %	75 ±1
Clarity	clear
Cure	15'' - 25''
Density grams / litre	1050

Air Dry Enamels

Table 2—Paint Formulation

	Properties
Alkyd Resin (75% non-volatile)	100.0
Wetting Agent ¹	4.0
Titanium Dioxide ²	200.0
Ammonium Hydroxide	8.0
Butyl Cellosolve	50.0
Defoamer ³	1.5
Water Grind to 7.5+ Hegman	150.0

1 Ross and Rowe 551

2 Kerr McGee Tronox CR 800

3 Diamond Shamrock Nopco NDW

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Early Water Resistance

After 6 hours dry time, water resistance was checked. A spot of water was placed on each panel and allowed to set for 5 minutes or for 1 hour. The 1 hour test was repeated after 24 hrs dry time.

Table 5—Early Water Resistance

	RD8876	RD8878	WS-549
5min. H ₂ O	slight spot, some blistering	very slight spot	slight spot
1hr. H ₂ O	Severe blistering	spot, film	slight spot
1hr. H ₂ O	blistering	softened	removed
24hrs Dry	no effect	no effect	no effect

Paint Stability

Samples of each paint were placed in a sealed glass jar and held @ 50°C for a 6 week period. Properties of the paint were measured at 3 weeks and 6 weeks. Tests included pH, dry times and early water spot resistance.

Table 6—Paint Stability

	RD8876	RD8878	WS-549
pH original	8.7	9.3	9.5
pH 3 weeks @ 50°C	7.6	7.9	7.9
pH 6 weeks @ 50°C	6.7	7.0	7.1
	separation	separation	

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Dry Time & Early Water Resistance

Table 7—Dry Time & Early Water Resistance

500 Gram Zapon	RD8876	RD8878	WS-549
Original, hours	1.5	1.5	1.1
3 weeks, hours	over 8 hrs.	over 8 hrs.	over 8 hrs.
6 weeks	not stable	not stable	over 8 hrs.
1hr. H ₂ O (24hr. Air Dry)			
Original	no effect	no effect	no effect
3 weeks	slight spot	slight spot	film lifted
6 weeks	not stable	not stable	film dissolved

Dry Films Properties & Gasoline Resistance (1hr.)

Table 8—Dry Films Properties & Gasoline Resistance (1hr.)

	RD8876	RD8878	WS-549
Film Thickness, mm	0.03	0.025	0.033
Pencil Hardness	HB	HB	HB
Scotch Tape Adhesion, %	100	100	100
Conical Mandrel	passed	passed	passed
Original Gloss	93	93	90
Gloss After Gasoline Exposure *	94 - very slight stain & softening	94 - very slight stain & softening	94 - very slight stain & softening

* All recovered after 1 hour.

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Stain & Solvent Resistance

Table 9—Stain & Solvent Resistance

	RD8876	RD8878	WS-549
Iodine	stain, blistered	stain, blistered	stain, slightly blistered
Mustard	stain, blistered	stain, blistered	stain, blistered
Ketchup	very slight stain	very slight stain	stain, blistered
5% Acetic Acid	blistered	blistered	no effect
Oil	no effect	no effect	no effect
5% HCl	no effect	no effect	slight spot
Xylene	spot blistered	slight wrinkling	very slight spot

Detergent Resistance

The panels were air dried for one week then immersed in a 3% tri-sodium phosphate solution for 10 minutes at 82°C. After rinsing the panels with cold water, they were dried with a paper towel.

Table 10—Detergent Resistance

	RD8876	RD8878	WS-549
Film Thickness, mm	0.033	0.03	0.036
Original Gloss	95	95	91
Gloss	53	95	91
Panel Condition	film softened	film softened	film softened & blistered

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Exposure to 50% Diethylene Glycol Solution

Table 11—Exposure to 50% Diethylene Glycol Solution

	RD8876	RD8878	WS-549
Film Thickness, mm	0.03	0.03	0.036
Original Gloss	95	96	94
Final Gloss	73	74	73
Panel Condition	very slight stain	very slight stain	very slight stain

Water Immersion

The panels were air dried for one week then placed in distilled water. Gloss readings were taken at 50hr intervals for a total exposure time of 300 hrs. The panel designated as #2 was scribed to bare metal with a razor blade prior to immersing in water.

Table 12—Detergent Resistance

	RD8876		RD8878		WS-549	
	# 1	# 2	# 1	# 2	# 1	# 2
Film Thickness, mm	0.03	0.03	0.03	0.03	0.03	0.03
Original Gloss	94	94	94	88	93	88
At 50 hrs.	95	89	95	93	87	25
At 100 hrs.	93	91	94	91	83	37
At 150 hrs.	95	89	94	92	82	36
At 200 hrs.	92	91	93	91	85	20
At 250 hrs.	91	91	91	91	83	33
At 300 hrs.	90	90	91	90	84	34
Panel Condition	no effect	no effect	no effect	Very slight rust at scribe after 250 hrs	Film wrinkled after 50 hrs	Film blistered at 50 hrs, spot rust after 200 hrs

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Humidity Resistance

The panels were air dried for one week, then placed in a Cleveland Condenser Humidity Cabinet 100017 and exposed to 100% relative humidity. Gloss readings were taken at 50hr intervals for a total exposure time of 350 hrs. The panel designated as #2 was scribed to bare metal with a razor blade prior to being placed in the humidity cabinet.

Table 13—Humidity Resistance

	RD8876		RD8878		WS-549	
	# 1	# 2	# 1	# 2	# 1	# 2
Film Thickness, mm	0.03	0.03	0.033	0.03	0.033	0.033
Original Gloss	94	89	96	93	92	89
At 50 hrs.	92	84	55	84	83	55
At 100 hrs.	91	84	53	84	83	60
At 150 hrs.	90	85	38	83	82	65
At 200 hrs.	89	88	54	87	81	74
At 250 hrs.	88	86	40	84	80	71
At 300 hrs.	88	86	55	86	81	78
At 350 hrs.	83	79	38	83	82	67
Panel Condition	no effect	no creepage at 350hrs	no effect	slight rust at scribe after 100hrs	slight cratering of film at 50hrs	3.2mm creepage at 100hrs

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Salt Spray Resistance

The panels were air dried for one week, then placed in a salt fog cabinet at $32^{\circ}\pm 0.5^{\circ}\text{C}$ using a 5% salt solution *. Gloss readings were taken at 50hr intervals for a total exposure time of 350 hrs. One panel of each was scribed with a razor blade down to bare metal and designated as #2.

Table 14—Salt Spray Resistance

	RD8876		RD8878		WS-549	
	# 1	# 2	# 1	# 2	# 1	# 2
Film Thickness, mm	0.033	0.03	0.03	0.03	0.033	0.033
Original Gloss	84	89	84	89	91	86
At 50 hrs.	92	79	93	73	91	86
At 100 hrs.	93	62	90	47	86	13
At 150 hrs.	93	47	89	47	74	9
At 200 hrs.	91	53	86	59	43	6
At 250 hrs.	91	59	87	67	pulled at 200 hrs.	pulled at 200 hrs.
At 300 hrs.	87	85	84	58	-	-
At 350 hrs.	89	35	85	14	-	-
Panel Condition	no effect	0.8mm rust creepage at scribe at 350 hrs.	no effect	1.6mm rust creepage at scribe at 350 hrs.	slight wrinkling at 50 hrs, slight rust at 100 hrs.	1.6mm rust creepage at 50 hrs.

* Both panels had defects, which showed up on paint film, giving low gloss readings. Faulty metal preparation on left side of panel.

Registration & Regulatory Information: Please refer to the safety datasheet.

Handling & Storage: DMPA[®] is classified as “DOT not regulated” by the US Department of Transportation and requires no special labelling for shipment. The Harmonized Tariff Code is 2918.19.40

DMPA[®] should be stored in a clean, dry area, following good warehousing practices.

Shelf-life: DMPA[®] has a minimum shelf of not less than 3 years if stored in its original unopened container and under normal storage conditions.

Miscellaneous: DMPA[®] is packaged in 250lb fibre drums, 50lb and 25kg multi-wall paper bags with HDPE liners and 500kg super sacks with LDPE liners.

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