



ROSHIELD™ 3275 Hydroxyl Functional High-Performance Acrylic Emulsion

for Wood Coatings

Description

ROSHIELD™ 3275 Acrylic Emulsion is specifically designed for reaction with water-dispersible polyisocyanates for wood coating applications where early hardness and sandability are important, under mild drying conditions. Unlike nitrocellulose lacquers, solventborne 2-component polyurethanes, and solventborne acid catalyzed finishes, waterborne polyurethane coatings based on this acrylic polyol have extremely low VOCs and very good early print resistance. In addition, films based on this emulsion are water-white and resistant to yellowing.

ROSHIELD 3275 Acrylic Emulsion cures under ambient conditions, but heat on-line is recommended for early pack-out. Applications for this excellent, cost/performance, 2-package system include clear, pigmented and flatted systems for office and laboratory furniture, kitchen cabinets and fine furniture.

Typical Physical Properties

(These properties are typical but do not constitute specifications).

Property	Typical Values
Appearance	Milky white liquid
Solids content, % by weight	42
Solids content, % by volume	38.5
pH	7.5
Equivalent weight (as supplied; theoretical)	3100
Hydroxy number	43
Brookfield viscosity, CP	50 to 500
Density, lb/U.S. gal (kg/L)	
Wet	8.9 (1.06)
dry	9.8 (1.17)
Minimum Film Formation Temperature (MFFT), °C (°F)	5 to 15 (41 to 59)
Freeze/thaw stability	Protect from freezing
Mechanical stability (5 min. Waring Blender)	Passes
Heat stability (10 days/140°F)	Passes

UNRESTRICTED – May be shared with anyone

©™ Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow 884-00251-0812-NAR-EN-CDP
 ROSHIELD™ 3275 Hydroxyl Functional High-Performance Acrylic Emulsion / Dow Coating Materials 05/2013, Rev. 0

Polyisocyanate Recommendation

Bayer Corporation's polyisocyanate, Bayhydur 302, is specifically recommended to crosslink ROSHIELD™ 3275 Acrylic Emulsion. This TSCA-approved polyisocyanate is more water dispersible than earlier commercial products. The typical properties of Bayhydur 302 are:

Weight solids, %	100
NCO content, %	17.1
Equivalent weight	245
Brookfield viscosity, CP	1000 to 5000

Weight of Polyisocyanate Needed to Crosslink ROSHIELD™ 3275 Acrylic Emulsion

The following formulation should be used to calculate how much Bayhydur 302 water-reducible polyisocyanate must be used to crosslink a specific weight of ROSHIELD™ 3275 polyol Acrylic Emulsion given a NCO:OH stoichiometric ratio of 2:1.

$$\text{(weight of polyisocyanate)} = \frac{\text{(weight of polyol)} \text{ (stoichiometric ratio)} \text{ (equivalent weight polyisocyanate)}}{\text{(equivalent weight of polyol)}}$$

For example, assuming 300 g of polyol:

$$\begin{aligned} ? \text{ g of Bayhydur 302} &= \frac{(300 \text{ g ROSHIELD 3275}) (2) (245 \text{ g Bayhydur 302})}{(3100 \text{ g ROSHIELD 3275})} \\ &= 47.4 \text{ g of Bayhydur 302} \end{aligned}$$

Potlife

Depending on the stoichiometric ratio of polyisocyanate to polyol, the two-component waterborne system does not have a "potlife" in the usual sense, in that increasing viscosity and gelation do not necessarily dictate the end of the coating's life. Potlife is measured by a decrease in the coating's properties, such as chemical resistance and edge soak resistance.

In normal, air-conditioned laboratories with temperatures at 60 to 70°F (15 to 20°C) and 40 to 70% relative humidity, the expected potlife of a ROSHIELD™ 3275 Acrylic Emulsion and Bayhydur 302 polyisocyanate formulation would be:

Stoichiometric Ratio NCO:OH Bayhydur 302 polyisocyanate:	
ROSHIELD™ 3275 Acrylic Emulsion	Potlife, hr
1:1	8
1.5:1	6
2:1	4-8

Useable potlife decreases at higher temperatures.

Additives and Formulation Techniques

ROSHIELD™ 3275 Acrylic Emulsion can be formulated with most common additives available for waterborne coatings. Shear or shock-sensitive additives may require a specific order of addition.

Coalescents: Typical formulations based on ROSHIELD 3275 Acrylic Emulsion and Bayhydur 302 polyisocyanate achieve full film properties at ambient temperatures in the absence of any coalescent. Ultra low VOC formulations, with VOC levels under 0.1 lb/solid lb, are possible when using this 2-component coating system.

Occasionally, it can be beneficial to incorporate a small amount of a coalescent like dipropylene glycol methyl ether or dipropylene glycol dimethyl ether into the formulation. A typical recommended level is five to seven percent coalescent on latex solids. The coalescent should be pre-mixed with water, and then added slowly to the acrylic latex while mixing. This level of coalescent adds about 0.5 pounds per gallon to the total VOC of the formulation.

The use of slow coalescents, such as n-methyl pyrrolidone, is not recommended since these materials can be trapped in the final film.

Mar Aids: Waxes such as Michem Emulsion 39235 and silicones such as Tego Glide 410 give excellent mar and slip to formulated ROSHIELD 3275/Bayhydur 302 topcoats.

Flattening Agents: Ceraflour 921 is the recommended flattening agent to reduce the gloss of ROSHIELD 3275 Emulsion. To aid gloss reduction (below 30 sheen) the polyisocyanate may be reduced 1:1 by weight with dipropylene glycol dimethyl ether solvent. The addition of solvent to the polyisocyanate causes a larger particle size dispersion which reduces gloss.

Defoamers: Tego Foamex 805 works well for defoaming ROSHIELD 3275. Other defoamers may be appropriate, depending on the application method.

Viscosity Control: For formulation viscosity control, the use of an ACRYSQL™ HEUR (hydrophobically modified, ethoxylated urethane) Associative Thickener is strongly recommended. ACRYSQL RM-825 Associative Thickener is highly efficient in formulations based on ROSHIELD 3275. ACRYSQL RM-825 Associative Thickener is relatively unaffected by the slight pH drifts that occur in waterborne polyurethane systems.

Wetting Agents: Substrate wetting is enhanced by the addition of additives such as Surfynol 104DPM. These additives also help lower viscosity of formulated waterborne coatings.

TABLE 1: CHEMICAL RESISTANCE
ROSHIELD™ 3275 Emulsion CROSSLINKED WITH Bayhydur 302 polyisocyanate*

Laboratory Furniture Spot Test 1 Hour Contact/10 Drops/Covered	NCO:OH = 1:1	NCO:OH = 2:1
HCL, 37%	Slight discoloration	Slight discoloration
Nitric Acid, 70%	Fail	Fail
Nitric Acid, 30%	Pass	Pass
Sulfuric Acid, 96%	Fail	Fail
Sulfuric Acid, 50%	Pass	Pass
Acetic Acid, 99.8%	Slight discoloration	Slight discoloration
Ammonium Hydroxide, 30%	Slight discoloration	Pass
Sodium Hydroxide, 50%	Pass	Pass
Zinc Chloride, 55%	Pass	Pass
Solvents - withstand contact with 10 drops until evaporated	NCO:OH = 1:1	NCO:OH = 2:1
Toluene	Pass	Pass
Methyl Alcohol	Pass	Pass
Ethyl Alcohol	Pass	Pass
Acetone	Pass	Pass
KCMA Edge Soak (1% of KCMA soln.)	Pass	Pass
KCMA Chemical & Solvent Resistance, 24 hours 15" ambient/15" 140°F	NCO:OH = 1:1	NCO:OH = 2:1
Instant Coffee	Pass	Pass
Lemon Juice	Pass	Pass
Grape Juice	Pass	Pass
409 Cleaner	Pass	Pass
Office Furniture Spot Test	NCO:OH = 1:1	NCO:OH = 2:1
Water	Pass	Pass
Mustard	Pass	Pass
Lipstick Coty 24 Medium Red	Pass	Pass

*This information is referenced from Two Component Waterborne Polyurethane Wood Coatings published by Rohm and Haas Company and Bayer Corporation (Code No. 82W11).

UNRESTRICTED – May be shared with anyone

©™ Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow 884-00251-0812-NAR-EN-CDP
 ROSHIELD™ 3275 Hydroxyl Functional High-Performance Acrylic Emulsion / Dow Coating Materials 05/2013, Rev. 0

STARTING POINT FORMULATION 3275-1
Waterborne, 2-component, Urethane Topcoat
Based on ROSHIELD™ 3275 Emulsion

Materials	Percent by Weight	Lb/100 U.S. Gal	Gal/100 U.S. Gal
Part A:			
ROSHIELD™ 3275	62.95	549.05	61.90
Premix and add under agitation			
Water	25.23	220.08	26.42
Dipropylene glycol monomethyl ether (DPM)	1.89	16.53	2.09
Then add:			
Byk-346 defoamer	0.09	0.75	0.09
ACRYSOL™ RM-825 Associative Thickener	0.19	1.49	0.17
Tego 410 additive (50% in DPM)	0.19	1.36	0.17
Tego Foamex 805 defoamer	0.94	7.99	0.96
Surfynol 104DPM additive	0.47	4.11	0.52
Michem Emulsion 39235	2.55	22.52	2.70
<hr/>			
Part B:			
Bayhydur 302 polyisocyanate	5.50	47.86	4.98
<hr/>			
TOTALS	100.00	871.74	100.00

Mixing Instructions:

Add Part B to Part A slowly with mild agitation for 5-10 minutes.

Formulation Constants

Approximate solids, % (wt.)	33.6
Approximate solids, % (vol.)	30.4
Viscosity, #2 Zahn cup, seconds	22-25
VOC, g/l	69.6
VOC, lb/gal	0.58
HAPS, lb/lb solids	0.00
NCO:OH Ratio	1.1:1.0
Potlife, hrs	4 to 8

UNRESTRICTED – May be shared with anyone

©™ Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow 884-00251-0812-NAR-EN-CDP
ROSHIELD™ 3275 Hydroxyl Functional High-Performance Acrylic Emulsion / Dow Coating Materials 05/2013, Rev. 0

STARTING POINT FORMULATION 3275-2
Waterborne, 2-component, Semigloss Urethane Topcoat
Based on ROSHIELD™ 3275 Emulsion

Materials	Percent by Weight	Lb/100 U.S. Gal	Gal/100 U.S. Gal
Part A:			
ROSHIELD™ 3275	62.10	542.76	61.19
Premix and add under agitation			
Water	25.23	220.66	26.49
Dipropylene glycol monomethyl ether	1.89	16.61	2.10
Then add:			
Byk-346 defoamer	0.09	0.75	0.09
ACRYSOL™ RM-825 Associative Thickener	0.19	1.49	0.17
Tego 410 additive (50% in DPM)	0.19	1.36	0.17
Tego Foamex 805 defoamer	0.94	7.99	0.96
Surfynol 104DPM additive	0.47	4.11	0.52
Michem Emulsion 39235	2.55	22.60	2.71
Ceraflour 921 flattening agent	0.85	7.62	0.62
<hr/>			
Part B:			
Bayhydur 302 polyisocyanate	5.50	47.96	4.98
<hr/>			
TOTALS	100.00	873.91	100.00

Mixing Instructions:

Add Part B to Part A slowly with mild agitation for 5-10 minutes.

Solids, % (wt.)	34.1
Solids, % (vol.)	30.7
Viscosity, #2 Zahn cup, seconds	22-25
VOC, g/l	69.60
VOC, lb/gal	0.58
HAPS, lb/lb solids	0.00
NCO:OH Ratio	1.1:1.0
Potlife, hrs	4 to 8

UNRESTRICTED – May be shared with anyone

©™ Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow 884-00251-0812-NAR-EN-CDP
 ROSHIELD™ 3275 Hydroxyl Functional High-Performance Acrylic Emulsion / Dow Coating Materials 05/2013, Rev. 0

STARTING POINT FORMULATION 3275-3
Waterborne, 2-component, White Urethane Topcoat
Based on ROSHIELD™ 3275 Emulsion

Materials	Percent by Weight	Lb/100 U.S. Gal	Gal/100 U.S. Gal
Part A:			
ROSHIELD™ 3275	54.42	531.85	59.96
Premix and add under agitation			
Water	15.11	147.27	17.66
Dipropylene glycol monomethyl ether	0.46	4.67	0.59
Then add:			
Byk-346 defoamer	0.06	0.83	0.10
Tego 410 additive (50% in DPM)	0.27	2.32	0.29
Aquasperse 877-0019 color dispersant	21.67	211.58	12.70
Tego Foamex 805 defoamer	0.98	9.73	1.17
Surfynol 104DPM additive	0.48	4.66	0.59
Michem Emulsion 39235	1.55	15.51	1.86
<hr/>			
Part B:			
Bayhydur 302 polyisocyanate	5.00	48.92	5.08
<hr/>			
TOTALS	100.00	977.34	100.00

Mixing Instructions:

Add Part B to Part A slowly with mild agitation for 5-10 minutes.

Formulation Constants

Solids, % (wt.)	45.4
Solids, % (vol.)	35.9
Viscosity, #2 Zahn cup, seconds	25-27
VOC, g/l	74.40
VOC, lb/gal	0.62
HAPS, lb/lb solids	0.00
NCO:OH Ratio	1.1:1.0
Potlife, hrs	4 to 8

UNRESTRICTED – May be shared with anyone

©™ Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow 884-00251-0812-NAR-EN-CDP
 ROSHIELD™ 3275 Hydroxyl Functional High-Performance Acrylic Emulsion / Dow Coating Materials 05/2013, Rev. 0

Handling Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Coating Materials Technical Representative for more information.

Chemical Registration

Many countries require the registration of chemicals, either imported or produced locally, prior to their commercial use. Violation of these regulations may lead to substantial penalties imposed upon the user, the importer or manufacturer, and/or cessation of supply. It is in your interest to ensure that all chemicals used by you are registered. Dow does not supply unregistered products unless permitted under limited sampling procedures as a precursor to registration.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

Contact:

Australia / NZ +61-3-9272-4222
South East Asia +65-6861-1077
Greater China +86-21-3851-1000
Japan +81-3-6238-4300
Korea +82-11-265-3736
India +91-22-6602-8888
<http://www.dow.com/coating>

NOTICE: No freedom from infringement of any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. The product shown in this literature may not be available for sale and/or available in all geographies where Dow is represented. The claims made may not have been approved for use in all countries. Dow assumes no obligation or liability for the information in this document. References to "Dow" or the "Company" mean the Dow legal entity selling the products to Customer unless otherwise expressly noted. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.



UNRESTRICTED – May be shared with anyone

®™ Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow 884-00251-0812-NAR-EN-CDP
ROSHIELD™ 3275 Hydroxyl Functional High-Performance Acrylic Emulsion / Dow Coating Materials 05/2013, Rev. 0