RHOPLEX™ VSR-2015 Binder

100% Acrylic Low-Solvent Capable Binder for Interior/Exterior Flat to Semi-Gloss Coatings For Architectural Coating Applications

Regional Product Availability

- North America

Description

RHOPLEX VSR-2015 Binder is a 100% Acrylic Binder designed for interior and exterior flat to semi-gloss coatings. Not only is RHOPLEX VSR-2015 Binder low-solvent capable, it also contains no APEO (alkyl phenol ethoxylate) surfactants and is low in ammonia odor. RHOPLEX VSR-2015 Binder does not require a coalescing solvent to pass a Low Temperature Film Formation test (40°F/40% RH) and offers some freeze-thaw resistance when formulated at 50 g/l VOC with glycol in our premium quality semi-gloss starting-point formulation.

RHOPLEX™ VSR-2015 Binder is a new and exciting technology platform, offering a combination of good scrub and stain resistance, along with good exterior durability compared to other low-solvent technology currently in the marketplace.

Care should be exercised when developing formulations with regard to defoamer and surfactant choices in order to get the best balance of defoaming and wetting of the paint film without sacrificing gloss potential when formulating to low VOC. RHOPLEX VSR-2015 Binder is compatible with ZnO for exterior formulations and also works well with other mildewcides like ROZONE™ 2000 or our other ROCIMA™ film preservative products. RHOPLEX VSR-2105 is blendable with PVAs, and its performance is comparable to that achieved from higher Tg acrylic binders currently used in the marketplace for this type of application. As for masonry applications, accelerated laboratory testing has found that RHOPLEX VSR-2015 Binder has very good resistance to alkaline substrates. Please consult your Dow Technical Service Representative for more details.

Benefits of Paints based on RHOPLEX™ VSR-2015 Binder

- Low-solvent capable in all formulation spaces—No Coalescent Required
- Low in ammonia odor
- Excellent low-temperature film formation
- Interior/exterior capability
- Blendable with vinyl acrylic
- User friendly for formulators—good TiO_2 slurry compatibility
- Excellent balance of abrasive scrub resistance and stain removal
- Very good early block resistance
- Excellent early blister resistance
- Very good adhesion to alkyd
- Very good alkali resistance
- Freeze-thaw capable at 50 g/l VOC (depending upon formulation space)

Typical Properties

(These properties are typical but do not constitute specifications).	
Appearance	White milky liquid
Solids, %	49.50–50.5
pH	7.3–8.3
Viscosity, cps	<500
Dry bulking value	0.106
Weight density, lbs./gal.	8.84
Recommended coalescent level, %	0

Key Performance Features

The following data table highlights some of the key benefits RHOPLEX™ VSR-2015 Binder has to offer when compared to current competitive technology in a premium, low-solvent, semi-gloss formulation (listed as a starting-point formulation in this brochure). This particular formulation is on our exposure fences at Spring House, PA and continues to exhibit good exterior durability, including dirt pick-up resistance. We also continue to monitor some of our other starting-point formulations listed in this brochure, including the exterior flat and satin with and without ZnO.

Premium Semi-Gloss 22 PVC/36 vs 0 g/l VOC	Competitive Low-Solvent Technology	RHOPLEX VSR-2015 Binder
Rheology Modifier Demand (wet lbs. HEUR)	Approximately 40 total wet lbs.	**+ (approximately 35 wet lbs.)**
Low Temp Film Formation		
40/70	Excellent	Excellent
40/40	Excellent	Excellent
20°/60° Gloss	45/75	=
Block - 1 day Oven	Variable	**Very Good**
Abrasive Scrub	1600	1450
Leneta/Federal Stain	Excellent	Excellent
Stain Removal		
% Hydrophobic	70	75
% Hydrophilic	38	**65**
Early Blister Resistance		
1 hr./24 hrs.	Fair–Poor	**Excellent**
Alkyd Adhesion		
1 day dry/wet	Excellent	Excellent
Laboratory Dirt Pick-up Resistance	Very Poor	**Excellent**

Formulating Guidelines

Coalescents

As stated, RHOPLEX VSR-2015 Binder does not require any coalescent to pass low temperature film formation, even with the addition of ZnO in the formulation. To date, we have performed several temperature and humidity studies at various film thicknesses and found no signs of cracking over sealed and unsealed surfaces.

Formulating Guidelines (Continued)

Pigments

The choice of proper titanium dioxide is always an important factor in achieving the desired balance of properties. An advantage of RHOPLEX™ VSR-2015 Binder is the compatibility it offers with a wide variety of slurry titanium dioxide grades. To date, we have evaluated several manufacturers' universal slurry and dry titanium dioxides—DuPont R- 706 and R-746, Kronos 2311 and 4311, Millennium 596 and 596S—and found no difference in performance across critical appearance properties like gloss, contrast ratio, and color acceptance. Since RHOPLEX VSR-2015 Binder is suitable for interior and exterior flat application, we also evaluated its performance with a recommended flat enamel grade of pigment from DuPont – R-902 – and found good performance.

Opaque Polymer

ROPAQUE™ Ultra Opaque Polymer is a synthetic pigment which is engineered to optimize hiding in architectural coatings. ROPAQUE Ultra Opaque Polymer enables the formulator to improve properties and realize cost savings. ROPAQUE Ultra Opaque Polymer can be effectively used in various formulations based on RHOPLEX VSR-2015 Binder (see the following formulations). In our High Quality Extended Semi-gloss Formulation, for example, you can still achieve approximately 1000 cycles of abrasive scrub resistance while maintaining other key properties in a 50 g/l VOC formulation thickened with HEUR thickeners utilizing 8% PVC of ROPAQUE Ultra Opaque Polymer.

Dispersants and Thickeners

The types and levels of pigment dispersants play an important role in attaining a desirable balance of rheology, gloss, and stability in paint formulations.

In formulations using HEUR thickeners such as ACRYSOL™ RM-2020 NPR as the primary thickener, TAMOL™ 165A and TAMOL 731A (hydrophobic copolymers) at a level of 0.85%–1.2% (active ingredient) on dry pigment provides a good balance of stability and overall properties to the finished coating. If using slurry grade TiO_2, you should account for the dispersant in the prepared slurry and adjust your formulations accordingly. We have also been very successful in using TAMOL 1124 (hydrophilic copolymer) in HEUR-containing formulations. Incorporating TAMOL 850 in the recommended High Quality Exterior Flat formulation with ZnO, provides a stable formulation with a good balance of properties.

To obtain the best balance of flow and sag resistance in our extended semi-gloss formulation, we found that the best HEUR rheology modifier package is a combination of ACRYSOL SCT-275/ACRYSOL RM-3000 (flow = 8, sag = 18). Other alternatives include ACRYSOL RM-895/ACRYSOL™ RM-3000, while a combination of ACRYSOL RM-2020NPR/ACRYSOL RM-8W is also an option, with slightly less sag resistance.

If interested in utilizing HASE thickeners, our work found the combination of ACRYSOL RM-6 and ACRYSOL™ TT-935 Thickeners result in a paint with a balance of flow and sag resistance.

Cellulosic thickeners will reduce flow when used with RHOPLEX VSR-2015 Binder and as such, are not recommended as the primary thickener. Cellulosics can be used as co-thickeners; however, levels should be kept to a minimum to maximize flow and leveling.

Defoamer and Surfactant

Limited work has been done for surfactant options with RHOPLEX™ VSR-2015 Binder. Our starting-point formulations recommend BYK™ 348, since it is an APEO-free surfactant and has proved successful in our lab evaluations for key properties. Work continues to look for other options, with the emphasis on APEO-free.

Formulating Guidelines (Continued)

As for defoamer options for RHOPLEX™ VSR-2015 Binder, we found that Tego™ 810 is the best option for our Premium Low-Solvent Semi-gloss formulation, resulting in a film that had a good balance of wetting and gloss capability. We have also found that BYK 024 and BYK 022 are a good recommendation for the Interior Satin Formulation. Other defoamers like Rhodaline™ 643 or Foamaster™ A-34 are viable options, depending upon the formulation space, VOC targets, and desired gloss/sheen levels.

Preservatives

Formulations based on RHOPLEX VSR-2015 Binder can be effectively preserved with KATHON™ LX 1.5% Microbiocide. KATHON LX 1.5% Microbiocide protects the paint through storage, transport, and end-use. The recommended level of addition is 25 ppm or approximately 1.65 lbs./1000 lbs. of paint.

Mildew Protection

While RHOPLEX VSR-2015 Binder can be used with low level of ZnO (25 pounds/ 100 gallons) in combination with SKANE™ M-8 Mildewcide, we also have exposures on our fences that contain either ROZONE™ 2000 or ROCIMA™ 20—all of which are looking good to date for mildew protection.

RHOPLEX VSR-2015 Binder Premium Interior/Exterior Low-Solvent Semi-Gloss Formulation, VSR-2015-1

Materials	Pounds	Gallons	Level
Grind			
Universal Grade Slurry TiO_2	349.8	18.00	22.19% PVC
TAMOL™ 731A	7.5	0.80	0.70% Disp
BYK 348	1.0	0.12	
Tego Foamex 810	0.5	0.06	
KATHON LX 1.5%	1.6	0.19	
Grind Sub-total	**360.4**	**19.17**	**22.19% PVC**
Letdown			
Water	20.9	2.50	
RHOPLEX™ VSR-2105 Binder	524.2	59.50	
Ammonia (28%)[1)]	0.7	0.09	
BYK 348	1.0	0.12	
Tego Foamex 810	0.5	0.06	
ACRYSOL™ RM-2020 NPR	30.5	3.50	
ACRYSOL RM-8W	4.3	0.50	
Water	121.3	14.56	
Totals =>	**1063.8**	**100.00**	**22.19% PVC**
Volume Solids:	36.00%	**Calculated VOC:**	0 g/l
Density:	10.638		
Gloss @ 20 degree:	45–50	**Initial KU:**	92–95
Gloss @ 60 degree:	75–80	**Initial ICI:**	1.0–1.2
		Initial pH:	8.4–8.6

1) If low odor is desired, consider using other amines like AMP™ 95.

NOTE: For exterior durability, a mildewcide of the formulators' choice is recommended.

RHOPLEX™ VSR-2015 Binder Premium Semi-Gloss with ROPAQUE Ultra, VSR-2015-2

Materials	Pounds	Gallons	Level
Grind			
Universal Grade Slurry TiO_2	286.5	14.75	17.25% PVC
TAMOL™ 731A	6.4	0.75	0.70% Disp
BYK 348	1.0	0.12	
Tego Foamex 810	0.5	0.06	
KATHON™ LX 1.5%	1.6	0.19	
Minex™ 10	8.5	0.39	1.02% PVC
Grind Sub-total	**304.5**	**16.26**	**18.27% PVC**
Letdown			
Water	62.5	7.50	
RHOPLEX VSR-2105 Binder	524.2	59.50	
ROPAQUE Ultra	49.0	5.75	8.00% PVC
Propylene Glycol	16.8	1.94	
Ammonia (28%)	0.5	0.07	
BYK 348	1.0	0.12	
Tego Foamex 810	0.5	0.06	
ACRYSOL™ RM-2020 NPR	28.0	3.25	
ACRYSOL RM-8W	2.0	0.25	
Water	44.2	5.30	
Totals =>	**1033.2**	**100.00**	**26.27% PVC**
Volume Solids:	38.03%	**Calculated VOC:**	50 g/l
Density:	10.332		
Gloss @ 20 degree:	35–40	**Initial KU:**	92–95
Gloss @ 60 degree:	65–70	**Initial ICI:**	1.20
		Initial pH:	8.5–8.7

NOTE: For exterior durability, a mildewcide of the formulators' choice is recommended.

RHOPLEX™ VSR-2105 Binder/ROVACE™ 9900 Semi-Gloss Blend (30/70), VSR-2015-3

Materials	Pounds	Gallons	Level
Grind			
Water	100.2	12.00	
Natrosol Plus™ 330	0.5	0.05	
AMP 95	3.9	0.50	
Propylene Glycol	6.1	0.25	
BYK 348	2.0	0.24	
Rhodaline 643	1.8	0.25	
KATHON™ LX 1.5%	1.6	0.19	
TAMOL™ 1124	5.0	0.50	1.15% Disp
Universal Grade Dry TiO_2	200.0	6.00	17.38% PVC
Minex 10	12.5	0.57	1.67% PVC
Attagel™ 50	3.0	0.15	0.44% PVC
Grind Sub-total	**336.6**	**20.70**	**19.49% PVC**
Letdown			
Water	116.9	14.00	
RHOPLEX VSR-2105 Binder	123.3	14.00	
ROVACE 9900	305.7	34.00	
ROPAQUE™ Ultra	59.8	7.00	10.57% PVC
ACRYSOL™ RM-2020 NPR	22.0	2.50	
Triton™ GR-7M	3.5	0.40	
Colloid™ 643	3.6	0.50	
ACRYSOL SCT-275	22.0	2.50	
Water	36.7	4.40	
Totals =>	**1030.1**	**100.00**	**30.06% PVC**
Volume Solids:	34.46%	**Calculated VOC:**	50 g/l
Density:	10.301		
Gloss @ 20 degree:	15–20	**Initial KU:**	85–89
Gloss @ 60 degree:	47–52	**Initial ICI:**	1.0–1.2
		Initial pH:	9.0–9.2

RHOPLEX™ VSR-2015 Binder High-Quality Interior Flat, VSR-2015-4

Materials	Pounds	Gallons	Level
Grind			
Natrosol 250 MHR	2.0	0.18	
Water	110.4	13.25	
TAMOL™ 731A	11.8	1.25	0.85% Disp
BYK 348	2.0	0.24	
Tego Foamex 810	2.0	0.24	
KATHON™ LX 1.5%	1.6	0.19	
Universal Grade Dry TiO_2	175.0	5.24	14.56% PVC
Minex 3	150.0	6.89	19.13% PVC
Diafil™ 525	25.0	1.37	3.81% PVC
Grind Sub-total	**479.8**	**28.85**	**37.50% PVC**
Letdown			
Water	39.6	4.75	
RHOPLEX VSR-2015 Binder	370.0	42.00	
ROPAQUE™ Ultra	44.4	5.25	7.50% PVC
Propylene Glycol	14.0	1.60	
Tego Foamex 810	2.0	0.24	
AMP 95	0.5	0.06	
ACRYSOL™ RM-2020 NPR	30.3	3.50	
Water	114.6	13.75	
Totals =>	**1095.2**	**100.00**	**45.00% PVC**
Volume Solids:	36.00%	**Calculated VOC:**	50 g/l
Density:	10.952		
		Initial KU:	85–88
20/60/85 Sheen	1.4/4.1/2.2	**Initial ICI:**	1.0–1.2
		Initial pH:	8.5–8.7

RHOPLEX™ VSR-2015 Binder High-Quality Satin Formulation, VSR-2015-5

Materials	Pounds	Gallons	Level
Grind			
Water	60.5	7.25	
TAMOL™ 1124	4.3	0.43	0.85% Disp
Proplylene Glycol	6.5	0.75	
BYK 024	2.0	0.24	
BYK 022	1.5	0.18	
BYK 348	1.0	1.11	
KATHON™ LX 1.5%	1.6	0.19	
Universal Grade Dry TiO_2	200.0	5.99	17.68% PVC
Omyacarb™ 5	25.0	1.11	3.27% PVC
Minex 10	25.0	1.15	3.39% PVC
Diafil 525	2.0	0.11	0.32% PVC
Grind Sub-total	**329.4**	**17.50**	**24.66% PVC**
Letdown			
Water	50.1	6.00	
BYK 024	1.5	0.18	
RHOPLEX VSR-2015 Binder	422.9	48.00	
ROPAQUE™ Ultra	47.0	5.50	8.44% PVC
Propylene Glycol	6.5	0.75	
AMP 95	3.0	0.32	
ACRYSOL™ RM-2020 NPR	39.2	4.50	
ACRYSOL RM-6	18.0	2.00	
Water	127.1	15.25	
Totals =>	**1044.7**	**100.00**	**33.10% PVC**
Volume Solids:	34.00%	**Calculated VOC:**	50 g/l
Density:	10.447		
		Initial KU:	88–92
20/60/80 Sheen	4.5/27.5/50.3	**Initial ICI:**	1.2–1.4
		Initial pH:	8.4–8.6

RHOPLEX™ VSR-2015 Binder High-Quality Exterior Flat w/ZnO, VSR-2105-6

Materials	Pounds	Gallons	Level
Grind			
Natrosol 250 MHR (2.5%)	109.1	13.00	
Water	108.5	13.00	
TAMOL™ 850	10.0	1.00	0.79% Disp
KTPP	1.5	0.06	0.39% Disp
BYK 348	2.5	0.31	
Propylene Glycol	3.1	0.35	
Tego Foamex 810	1.0	0.12	
Universal Grade Dry TiO_2	175.0	5.23	15.13% PVC
XX-503	25.0	0.51	1.54% PVC
Minex 4	125.0	5.70	16.56% PVC
Icecap™ K	50.0	2.25	6.57% PVC
Attagel 50	5.0	0.25	0.73% PVC
SKANE™ M-8	2.0	0.23	
Grind Sub-total	**617.7**	**42.01**	**40.53% PVC**
Letdown			
Tego Foamex 810	2.0	0.24	
RHOPLEX VSR-2015 Binder	339.2	38.50	
ROPAQUE™ Ultra	38.5	4.50	6.77 PVC
Propylene Glycol	11.0	1.25	
ACRYSOL™ RM-2020 NPR	30.2	3.50	
Water	83.3	10.00	
Totals =>	**1121.9**	**100.00**	**47.30 PVC**
Volume Solids:	34.65%	**Calculated VOC:**	50 g/l
Density:	11.219		
		Initial KU:	88–92
60/85 Sheen	4/7	**Initial ICI:**	1.0–1.2
		Initial pH:	8.3–8.5

RHOPLEX™ VSR-2015 Binder High-Quality Exterior Satin w/ZnO, VSR-2015-7

Materials	Pounds	Gallons	Level
Grind			
Water	64.7	7.75	
TAMOL™ 165A	13.3	1.50	1.01% Disp
BYK 348	2.5	0.31	
Tego Foamex 810	1.0	0.12	
Propylene Glycol	1.3	0.15	
Universal Grade Dry TiO_2	175.0	5.21	15.16% PVC
XX-503	25.0	0.50	1.54% PVC
Minex 7	75.0	3.41	9.95% PVC
KATHON™ LX 1.5%	1.5	0.18	
SKANE™ M-8	2.1	0.25	
Grind Sub-total	**361.4**	**19.38**	**26.66% PVC**
Letdown			
Tego Foamex 810	1.0	0.12	
RHOPLEX VSR-2015 Binder	429.5	48.75	
ROPAQUE™ Ultra	38.5	4.50	6.77% PVC
Propylene Glycol	13.0	1.50	
Ammonia (28%)	1.9	0.25	
ACRYSOL™ RM-2020 NPR	28.1	3.25	
ACRYSOL RM-8W	4.1	0.50	
Water	181.2	21.75	
Totals =>	**1058.7**	**100.00**	**33.42% PVC**
Volume Solids:	34.58%	**Calculated VOC:**	50 g/l
Density:	10.587		
		Initial KU:	85–90
60/85 Sheen	20/56	**Initial ICI:**	0.8–1.0
		Initial pH:	8.5–8.7

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.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

Storage

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

Disposal

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 within the Asia-Pacific 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 interests to ensure that all chemicals used by you are registered. The Dow Chemical Company does not supply unregistered products unless permitted under limited sampling procedures as a precursor to registration.

Note on Asia-Pacific Product Line

Product availability and grades vary throughout the countries in Asia-Pacific. Please contact your local Dow Coating Materials representative for further information and samples.

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:
North America: 1-800-447-4369
Latin America: (+55)-11-5188-9000
Europe: (+800)-3-694-6367
Asia-Pacific: (+800)-7776-7776
http://www.dowcoatingmaterials.com