



Technical Data Sheet

RHOPLEX™ VSR-1050 100% Acrylic Emulsion

Featuring
Advanced Acrylic
Technology
For Flat to
Semigloss
Architectural
Paints

Unique polymer architecture and ambient crosslinking are the foundation for exceptional performance in paints based on RHOPLEX™ VSR-1050 Emulsion. The versatility of RHOPLEX™ VSR-1050 Emulsion affords formulators one resin that provides outstanding performance in flat through semigloss paint formulations, for interior and exterior applications. The added benefit of low coalescent demand, enables paint formulators to meet the strictest VOC requirements in North America while delivering performance that exceeds conventional emulsion technology. Paints based on RHOPLEX™ VSR-1050 Emulsion excel in block, stain removal, film hardness, adhesion and scrub performance.

Features and
Benefits

- 100% acrylic, ambient crosslinking backbone
- Outstanding early block and film hardness
- Excellent household stain removal
- Very good abrasive scrub resistance
- Excellent alkyd adhesion
- User-friendly for formulators
- Excellent slurry compatibility
- Low coalescent demand
- Formulation latitude
 - Flat through semigloss
 - Interior/exterior
 - Meets new VOC regulations (50 g/l to 150 g/l)

Typical Physical
Properties¹

Property	Typical Values
Appearance	White Milky Liquid
Solids, %	49.5 - 50.5
pH	9.2 - 9.7
Viscosity, Brookfield, cP (#2 spindle, 60 rpm, 25°C)	400 max
Density, US gal/lb	8.75
Bulking Value of Dry Solids, US gal/lb	0.109
Minimum Film Formation Temperature, (MFFT), °C	2
Recommended Coalescent Level (on binder solids), %	2 - 3

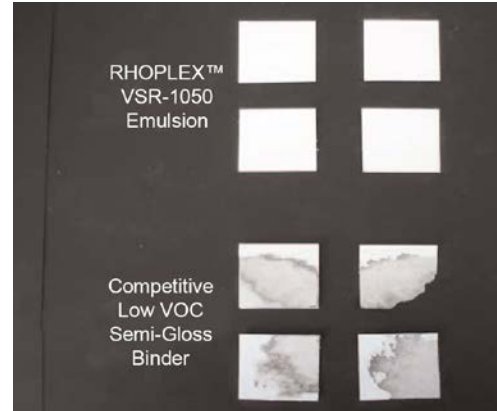
1. These properties are typical but do not constitute specifications.

Performance Profile of RHOPLEX™ VSR-1050 Emulsion Quality Extended Semigloss Formulation (28% PVC, 34% VS)

	RHOPLEX™ VSR-1050 Emulsion	Competitive Low VOC Binder
Coalescent %	2	0
VOC	50	50
Gloss, 20°/ 60°	24 / 60	28 / 63
1 Day Block Room Temp High Temp	Excellent (9) Excellent (9)	Poor (0) Poor (0)
Adhesion to Gloss Alkyd	Excellent	Fair
Household Stain Resistance (Hydrophilic stains % removed)	60	20
Abrasive Scrub Resistance (# of cycles to cut-through)	1120	1160

Early Block Resistance

The photo at right demonstrates the superior early block resistance of RHOPLEX™ VSR-1050 Emulsion in a 1 day high temperature block test. The semigloss paint based on a competitive binder clearly shows tearing of the paint film, while the semigloss paint based on RHOPLEX™ VSR-1050 Emulsion retains its integrity. Note that the competitive binder test area is stained with Nigrosin dye to show the film tearing.



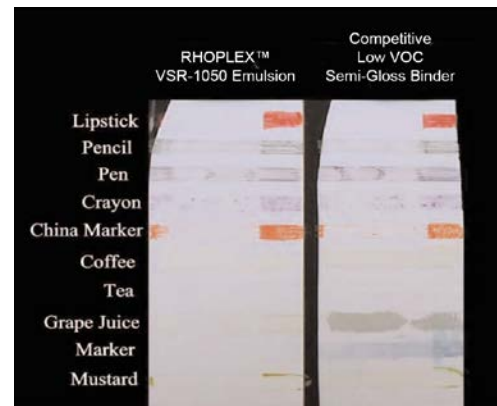
Adhesion to Gloss Alkyd

The excellent adhesion to gloss alkyd of RHOPLEX™ VSR-1050 Emulsion based paints is demonstrated in the photo at right. Dry or wet conditions, RHOPLEX™ VSR-1050 Emulsion outperforms the semigloss paint based on a competitive binder.



Household Stain Removal

The excellent household stain removal of a semigloss paint based on RHOPLEX™ VSR-1050 Emulsion, relative to a competitive binder, is shown in the picture at right.



Coalescents

To date, we have found that 2% Texanol ester alcohol based on binder solids, is an adequate level to achieve good Low Temperature Film Formation in our starting point formulations. If formulating with reactive pigments, such as zinc oxide, coalescent demand may be higher. Also, if formulating for extreme cold conditions, coalescent level may be slightly higher. We also continue to screen various non-volatile coalescents as a way to either achieve near zero VOC formulations or improve freeze thaw in some formulations. Because the overall coalescent demand is very low for RHOPLEX™ VSR-1050 Emulsion, it is possible to fully replace Texanol ester alcohol, Velate 368 coalscent, or other volatile coalescent, and not offset any key property performance feature of the final coating.

Pigments

The choice of the proper titanium dioxide grade is an important factor in achieving the desired balance of appearance and resistance properties. An advantage of RHOPLEX™ VSR-1050 Emulsion is the compatibility it offers with a wide variety of slurry titanium dioxide grades. To date, we have evaluated several manufacturers' universal slurry titanium dioxides in various starting point formulations – DuPont 746, Kronos 4311, Millennium 596S, and Kerr-McGee 826S – and found no difference in performance. We expect other manufacturers' universal titanium dioxide slurries to give similar performance. Limited work with dry grades of universal TiO₂ also showed acceptable performance.

Opaque Polymer

ROPAQUE™ Ultra and ROPAQUE™ OP-96 Opaque Polymers are synthetic pigments which are engineered to optimize hiding in architectural coatings. These opaque polymers enable the formulator to improve properties and realize cost savings. Both of these opaque polymers can be effectively used in various formulations based RHOPLEX™ VSR-1050 Emulsion (see attached formulations). Specific gloss and hiding targets need to be considered when determining the best level of opaque polymer to use.

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 ACRY SOL™ RM-2020 NPR Rheology Modifier as the primary thickener, TAMOL™ 165A Hydrophobic Copolymer or TAMOL™ 731A Hydrophobic Copolymer at a level of 0.85% to 1.0% (active ingredient) on dry pigment provides a good balance of overall properties. If using slurry grade TiO₂, you should reduce the level of dispersant to achieve your desired properties.

Current formulations use ACRY SOL™ RM-2020 NPR and ACRY SOL™ SCT-275 Thickeners. We have also found that ACRY SOL™ RM-5000 Thickener is a good alternative to ACRY SOL™ RM-2020 NPR Thickener. Work is in progress to optimize thickener packages (HEUR and HASE) for RHOPLEX™ VSR-1050 Emulsion. Please consult your Dow Technical Service Representative for further assistance.

Cellulosic thickeners will reduce flow when used with small particle size emulsions, such as RHOPLEX™ VSR-1050 Emulsion, and are not recommended for use as the primary thickener. Cellulosics can be used as co-thickeners; however, use levels should be kept to a minimum to maximize flow. If a cellulosic co-thickener is needed, greater flow can be obtained with lower molecular weight grades.

Defoamer and Surfactant

Based upon limited formulation work, we have found Foamstar A-34 defoamer to be adequate for brush and roller applications. Work continues to look at new defoamers from several manufacturers, particularly for the low VOC market. Consult your Technical Service Representative for further assistance. Note that spray application and/or highly tinted systems may require more or different defoamers to achieve the proper balance of properties.

Several surfactants have been evaluated in our formulation work, and we have found that TRITON™ CF-10 Surfactant and Byk-348 defoamer work well in our low VOC formulating spaces. Work continues to look for more options.

Preservatives

KATHON™ LX 1.5% Microbicide is an effective preservative that will protect paint formulations based on RHOPLEX™ VSR-1050 Emulsion. The recommended use level is 25 ppm or 1.65 pounds per 1,000 pounds of paint. Preservative efficacy should be evaluated once a final formulation has been selected.

Formaldehyde or formaldehyde-releasing preservatives will adversely affect the performance of paints based on RHOPLEX™ VSR-1050 Emulsion and are not recommended for use with this emulsion polymer. In choosing a preservative, it is recommended to check with the raw material supplier to ensure that formaldehyde or formaldehyde-releasers are not present.

Mildew Protection

For exterior applications, the use of an effective paint mildewcide is recommended. ROCIMA™ 20 Mildewcide is currently being evaluated in various exposures, and thus far, looks very good for mildew protection.

High Quality Unextended Semigloss Formulation for RHOPLEX™ VSR-1050 Emulsion

Material	Pounds	Gallons	Level
<i>Grind/Pre-mix</i>			
Water	70.9	8.50	
TAMOL™ 165A Hydrophobic Copolymer	6.0	0.67	0.48% Disp.
Propylene Glycol	8.6	1.00	
Universal Grade of TiO ₂ Slurry	341.1	17.50	23.00% PVC
KATHON™ LX 1.5% Microbicide	1.8	0.21	
Grind Sub-Totals	428.4	27.88	23.00% PVC
<i>Let Down</i>			
RHOPLEX™ VSR-1050 Emulsion	484.0	55.25	
Propylene Glycol	2.0	0.25	
Texanol ester alcohol	4.8	0.60	2.00% Coal
Byk-348 defoamer	2.0	0.22	
Foamstar A-34 defoamer	2.0	0.25	
Ammonia (28%)	0.4	0.05	
ACRYSOL™ RM-2020 NPR Thickener	30.3	3.50	
ACRYSOL™ SCT-275 Thickener	4.5	0.50	
Water	95.8	11.50	
Totals	1054.2	100.00	23.00% PVC
Formulation Constants			
Weight, Solids, %	47.66		
Volume, Solids, %	34.00		
Solvent, %	1.51		
Density, lbs/gal	10.5420		
VOC	50		
Dispersant, %	0.48		
Coalescent, %	2.00		
pH	9.0 - 9.2		
Gloss			
20°	38 - 42		
60°	72 - 76		
Viscosity, Krebs	105 - 110		
ICI	1.0 - 1.2		

High Quality Extended Semigloss Formulation for RHOPLEX™ VSR-1050-2 Emulsion

Material	Pounds	Gallons	Level
<i>Grind</i>			
Water	20.8	2.50	
TAMOL™ 165A Hydrophobic Copolymer	6.0	0.69	0.47% Disp.
Byk-348 defoamer	2.0	0.22	
Foamstar A-34 defoamer	1.0	0.12	
Minex 10 filler	7.5	0.34	1.00% PVC
Universal Grade of TiO ₂ Slurry	336.8	17.25	22.70% PVC
KATHON™ LX 1.5% Microbicide	1.8	0.21	
Grind Sub-Totals	375.9	21.39	23.70% PVC
<i>Let Down</i>			
RHOPLEX™ VSR-1050 Emulsion	454.2	52.00	
ROPAQUE™ Ultra Opaque Polymer	23.5	2.75	4.30% PVC
Propylene Glycol	9.0	1.00	
Texanol ester alcohol	4.5	0.57	2.00% Coal
Foamstar A-34 defoamer	1.0	0.12	
Ammonia (28%)	0.8	0.10	
ACRYSQL™ RM-2020 NPR Thickener	33.0	3.80	
ACRYSQL™ SCT-275 Thickener	5.0	0.58	
Water	147.4	17.75	
Totals	1054.3	100.00	28.00% PVC
Formulation Constants			
Weight, Solids, %	47.15		
Volume, Solids, %	34.00		
Solvent, %	1.48		
Density, lbs/gal	10.5430		
VOC	50		
Dispersant, %	0.47		
Coalescent, %	2.00		
pH	8.8 - 9.2		
Gloss			
20°	20 - 24		
60°	55 - 60		
Viscosity, Krebs	95 - 100		
ICI	0.9 - 1.1		

Quality Satin Formulation for RHOPLEX™ VSR-1050-3 Emulsion

Material	Pounds	Gallons	Level
<i>Grind</i>			
Water	10.5	1.25	
Universal Grade of TiO ₂ Slurry	267.1	13.75	18.00% PVC
TAMOL™ 165A Hydrophobic Copolymer	3.6	0.41	0.30% Disp.
Minex 10 filler	50.0	2.30	6.25% PVC
Foamstar A-34 defoamer	1.0	0.13	
KATHON™ LX 1.5% Microbicide	1.8	0.21	
Grind Sub-Totals	334.0	18.04	24.25% PVC
<i>Let Down</i>			
Water	50.0	6.00	
RHOPLEX™ VSR-1050 Emulsion	472.3	53.75	
ROPAQUE™ Ultra Opaque Polymer	49.2	5.75	8.75% PVC
Texanol ester alcohol	4.6	0.58	2.00% Coal
Propylene Glycol	10.8	1.25	
Byk-348 defoamer	1.6	0.20	
Ammonia (28%)	0.4	0.05	
ACRYSQL™ RM-2020 NPR Thickener	26.0	3.00	
ACRYSQL™ SCT-275 Thickener	2.2	0.25	
Water	93.0	11.13	
Totals	1044.1	100.00	33.00% PVC
Formulation Constants			
Weight, Solids, %	45.996		
Volume, Solids, %	34.000		
Solvent, %	1.548		
Density, lbs/gal	10.4410		
VOC	50		
Dispersant, %	0.30		
Coalescent, %	2.00		
pH	9.1 - 9.3		
Gloss			
20°	7 - 10		
60°	35 - 40		
Viscosity, Krebs	95 - 100		
ICI	1.0 - 1.2		

High Quality Flat Formulation for RHOPLEX™ VSR-1050-4 Emulsion

Material	Pounds	Gallons	Level
<i>Grind</i>			
Natrosol 250 MHR (2.5%)	100.8	12.00	
Water	37.7	4.5	
TAMOL™ 165A Hydrophobic Copolymer	17.6	2.00	1.00% Disp.
TRITON™ CF-10 Surfactant	2.2	0.25	
Foamaster SA-3 defoamer	1.0	0.14	
KATHON™ LX 1.5% Microbicide	1.8	0.21	
Universal Grade of TiO ₂ Dry	200.0	6.00	15.85% PVC
Minex 4 filler	175.0	8.01	20.29% PVC
Diafil 525 matting agent	12.5	0.69	1.86% PVC
Grind Sub-Totals	548.6	33.8	38.00% PVC
<i>Let Down</i>			
Water	37.7	4.50	
RHOPLEX™ VSR-1050 Emulsion	375.0	43.00	
ROPAQUE™ Ultra Opaque Polymer	48.7	5.75	8.00% PVC
Foamaster SA-3 defoamer	1.5	0.21	
Texanol ester alcohol	4.0	0.50	2.00% Coal
Propylene Glycol	12.2	1.42	
ACRYSOL™ RM-2020 NPR Thickener	17.5	2.00	
Water	73.5	8.82	
Totals	1118.70	100.00	46.00% PVC
Formulation Constants			
Weight, Solids, %	51.28		
Volume, Solids, %	37.00		
Solvent, %	1.48		
Density, lbs/gal	11.1879		
VOC	50		
Dispersant, %	1.00		
Coalescent, %	2.00		
pH	8.5 - 9.5		
Gloss			
60°	5		
85°	7		
Viscosity, Krebs	90 - 95		
ICI	1.0 - 1.2		

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 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 Technical Representative for more information.

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.dow.com>

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.

