

## Rhoplex Multilobe™ 400

### 100% Acrylic Binder

Rhoplex Multilobe™ 400 emulsion polymer represents Rohm and Haas Company's progress in design of an APEO (alkyl phenol ethoxylate) surfactant free binder for low-VOC exterior flat paints, providing excellent durability, color retention, and dirt pick-up resistance.

Rhoplex Multilobe™ 400 is the latest addition to the Multilobe™ product family which utilizes a combination of technologies from the Rohm and Haas. First and foremost, Multilobe™ technology enhances film-build performance and reduces thickener demand. Also, polymer composition has been modified to a slightly lower Tg relative to Multilobe™ 200 in order to optimize the balance of properties with lower co-solvent levels.

The physical properties of Multilobe™ 400 can be found in Table 1:

<b>Table 1</b>	
<b>Typical Physical Properties</b>	
These properties are typical but should not be considered specifications	
Solids Content, %	53.5-54.5
pH	8.5 – 9.2
Viscosity, cP	300 – 1,500
Gel Content, g/qt	
100 Mesh	0.05 max
325 Mesh	0.10 max
Polymer Dry Density, lb/gal	9.4
Tg, DSC, onset, °C	8

A summary of features and benefits can be found in Table 2.

<b>Table 2</b>		
<b>Summary of Features and Benefits</b>		
<b>Features</b>	<b>Manufacturer Benefit<sup>‡</sup></b>	<b>User Benefit</b>
Increased film build	Minimized level and cost of thickener	Best applied hiding, uniformity of appearance, and durability.
Chalk-adhesion	No alkyd modification required	Resistance to blistering and related ultimate flaking.  Elimination of alkyd modification means better mildew resistance, tint retention and color compatibility, and easier brush clean-up.
Wet adhesion	Tolerates rheology modifiers; Suitability for variety of substrates.	Resistance to cracking, flaking, and peeling over wood and repaint surfaces.
Lower cost	Outstanding balance of properties at a lower raw material cost compared to other all-acrylic binders.	Potential for higher value exterior paints.
All-Acrylic binder	Proven performance over a broad formulating range.	Confidence in quality of paint.
Chalk resistance/ dirt resistance	Formulating latitude: Flat and sheen paints; Use of different extender types.	Long-term tint retention and appearance.
Minimized level of surfactant for color acceptance	Ease of color acceptance; Reduced foaming, surfactant leaching, and water sensitivity; Reduced raw material costs.	Good appearance; Minimized foaming.

<sup>‡</sup> Manufacturer benefits are those in addition to minimized failures and maximized customer satisfaction.

### **Formulating Guidelines:**

In the past, Rohm and Haas typically recommended a single coalescent level for each of its products. Our recommendation with this low VOC polymer, however, is different, because the use of coalescent and co-solvent levels are severely restricted by the 50 g/L VOC limit.

PVC can have a strong impact on the LTFF of a paint, and this will affect the minimum level of coalescent required. Generally, higher PVC paints require a higher percentage of coalescent based on polymer solids to achieve equivalent LTFF. We typically recommend a level of 2% coalescent with Rhoplex Multilobe™ 400 to achieve good film formation.

Freeze/thaw stability can also be affected in low VOC formulations. Minimizing coalescent levels can improve freeze/thaw stability in two ways. First, the reduction of strong coalescent, such as Texanol™, reduces coalescent induced polymer swelling, thus improving colloidal stability. Second, using lower levels of coalescent allows the use of higher levels of freeze/thaw aids, such as propylene glycol, within the 50 g/L VOC limit, thus improving freeze/thaw stability directly.

Zinc oxide and other additives can also impact both LTFF and freeze/thaw stability. The best practice for choosing the appropriate coalescent/glycol balance in a given formulation is by testing the paints at various levels of coalescent/glycol, measuring the resulting LTFF/freeze/thaw balance, and choosing a level that is most appropriate for the needs of the end user.

A summary of performance properties of Multilobe™ 400 versus Multilobe™ 200 in a 50g/L VOC formulation can be found in Table 3:

<b>Table 3</b>			
<b>Properties of Quality Flat Paints Formulated with Rhoplex Multilobe 400 at 50 g/L VOC and Rhoplex Multilobe 200 at 50 and 183 g/L VOC<sup>‡</sup></b>			
<b>Quality Flat Paint Formulation</b>	<b>Rhoplex Multilobe 400</b>	<b>Rhoplex Multilobe 200</b>	
	<b>50 g/L VOC</b>	<b>50 g/L VOC</b>	<b>183 g/L VOC</b>
Equilibrated Stormer Viscosity <sup>1</sup> , KU	89	92	92
Equilibrated ICI Viscosity, P	0.9	1.0	1.1
Thickener Demand, HEC lb/100 gal	4.58	4.43	4.42
Film Build, g/ft <sup>2</sup>	8.1	7.6	8.9
60° Gloss, drawdown	3.4	3.4	3.1
85° Sheen, drawdown	4.3	4.0	3.7
Blistering <sup>2</sup> , Gloss Alkyd Substrate	10	10	10
Blistering <sup>2</sup> , Chalky Latex Substrate	4M	4M-D	8M-D
LTFF 50°F/70% RH 4-24 Sag Bar drawdown	Good	Good	Good
Freeze-Thaw Stability, 5 cycles	Good	Fail	Good
Total PVC, VS	49PVC, 39VS	49PVC, 39VS	46PVC, 37VS

<sup>1</sup> Hand stirred/sheared.

<sup>2</sup> After 1 day in a fog box.

Blistering Key: Size 1=Large, 9=Extremely Small; Density F=Few, M=Medium, D=Dense

<sup>‡</sup> Note: The 183 g/L VOC quality flat paint formulation is based on Formulation W-200-5 (see formulation in this brochure) using Ti-Pure™ R-706, Ropaque™ Ultra opaque polymer, and American Zinc Oxide. The 50 g/L VOC quality flat paint formulation is based on Formulation W-400-1 (see formulation in this brochure).

A summary of the performance properties of Multilobe™ 400 and Multilobe™ 200 in a 100g/L VOC formulation can be found in Table 4.

<b>Table 4</b>			
<b>Properties of Quality Flat Paints Formulated with Rhoplex Multilobe 200 at 100 g/L VOC and Rhoplex Multilobe 400 at 50 and 100 g/L VOC<sup>‡</sup></b>			
<b>Quality Flat Paint Formulation</b>			
	<b>Rhoplex Multilobe 200 100 g/L VOC</b>	<b>Rhoplex Multilobe 400 100 g/L VOC    50 g/L VOC</b>	
Equilibrated Stormer Viscosity <sup>1</sup> , KU	95	92	95
Equilibrated ICI Viscosity, P	1.1	1.0	1.0
Thickener Demand, HEC lb/100 gal	4.06	4.18	4.63
% Texanol,	6.0	2.0	2.0
60° Gloss, drawdown	3.4	3.5	3.7
85° Sheen, drawdown	5.1	5.0	4.9
Blistering <sup>2</sup> , Gloss Alkyd Substrate	10	10	10
Blistering <sup>2</sup> , Chalky Latex Substrate	9VF	9VF	9VF
LTFF 50°F/70% RH 4-24 Sag Bar drawdown	Good	Good	Good
Freeze-Thaw Stability, 5 cycles	Good	Excellent	Good
Total PVC, VS	49PVC, 39VS	49PVC, 39VS	49PVC, 39VS

<sup>1</sup> Hand stirred/sheared.

<sup>2</sup> After 1 day in a fog box.

Blistering Key: Size 1=Large, 9=Extremely Small; Density F=Few, M=Medium, D=Dense

<sup>‡</sup> Note: The 183 g/L VOC quality flat paint formulation is based on Formulation W-200-5 (see formulation in this brochure) using Ti-Pure™ R-706, Ropaque™ Ultra opaque polymer, and American Zinc Oxide. The 50 g/L VOC quality flat paint formulation is based on Formulation W-400-1 (see formulation in this brochure).

### Exterior Durability Information

Rhoplex Multilobe™ 400 is an APEO free version of Rhoplex Multilobe™ 300. The earliest exterior exposures of prototypes of Rhoplex Multilobe™ 300 emulsion polymer were initiated in February 2003. We have high confidence that Rhoplex Multilobe™ 400 will have a similar property balance to that of Rhoplex Multilobe™ 200 because it was developed from the technical approaches used in other successful exterior flat products and prototypes.

## Formulation W-400-1

A high-quality, 49% PVC/39% volume solids exterior flat architectural paint based on Rhoplex Multilobe 400 acrylic emulsion polymer.

**Quality Exterior  
Flat Paint Based on  
Rhoplex Multilobe 400**

Materials	Pounds	Gallons
Natrosol™ 250 MHR (2.5%)	100.0	11.86
Tamol™ 850 (30.0%)	10.6	1.06
KTPP	1.5	0.07
Surfactant <sup>1</sup>	2.5	0.29
Colloid™ 643	1.0	0.14
Skane™ M-8	2.0	0.23
Ti-Pure™ R-706	175.0	5.24
Eagle Zinc 417W	25.0	0.53
Minex™ 4	170.0	7.80
Icecap™ K	50.0	2.28
Attigel™ 50	5.0	0.25
Grind the above at high speed for 20 minutes; then let down with the following:		
Rhoplex™ Multilobe™ 400 (54.0%)	344.0	38.82
Ropaque™ Ultra (30.0%)	50.0	5.85
Colloid™ 643	3.0	0.42
Texanol™	4.0	0.51
Propylene Glycol	11.3	1.30
Natrosol™ 250 MHR (2.5%)	83.1	9.86
Water	<u>12.6</u>	<u>1.51</u>
Total	1,150.7	100.00

### Properties

PVC, %	49.10
Volume Solids, %	39.0
Weight Solids, %	54.4
pH	8.8-9.0
Stormer Viscosity, equilibrated, KU	89
ICI Viscosity, equilibrated, P	1.0
VOC, gm/L	50

<sup>1</sup> Note: This formulation originally contained Triton™ CF-10. To date, we have also tested BYK-348 and have found no issues.

## Formulation W-200-5

A high-quality exterior flat architectural paint based on Rhoplex Multilobe 200 acrylic emulsion polymer and made with Skane™ M-8 mildewcide and zinc oxide.

**Quality Exterior  
Flat Paint Based on  
Rhoplex Multilobe 200**

Materials	Pounds	Gallons
Natrosol™ 250 MHR	3.0	0.26
Ethylene Glycol	25.0	2.68
Water	120.0	14.40
Tamol™ 850 (30%)	9.5	0.96
KTPP	1.5	0.07
Triton™ CF-10	2.5	0.28
Colloid™ 643	1.0	0.13
Propylene Glycol	34.0	3.93
Ti-Pure™ R-902	225.0	6.75
Zinc Oxide, AZO 66LP	25.0	0.53
Minex™ 4	150.0	6.91
Icecap™	50.0	2.28
Attagel™ 50	5.0	0.25

Grind the above at high speed for 20 minutes; then let down with the following:

Rhoplex Multilobe™ 200 (53.5%)	345.0	38.88
Colloid™ 643	3.0	0.39
Texanol™	9.2	1.16
Skane™ M-8	2.0	0.23
Ammonia, 28%	0.2	0.03
Natrosol™ 250 MHR (2.5%)	94.0	11.28
Water	<u>71.6</u>	<u>8.60</u>
Total	1,176.5	100.00

### Properties

PVC, %	45.9
Volume Solids, %	36.5
Weight Solids, %	54.4
pH	8.8-9.0
Stormer Viscosity, equilibrated, K.U.	100
ICI Viscosity, equilibrated, P	1.2
V.O.C., gm/l	179

Note: 1. For preservation, Rohm and Haas recommends Kathon™ LX 1.5% microbicide. 2. This formulation passed heat-age (10 days @ 140°F) and extended low shear (10 days, roller) stability tests. However, the formulator should determine suitability with the particular raw materials to be used.

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**TABLE 5**

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**Rohm and Haas Additives for Use in Exterior Paints  
Based on Rhoplex Multilobe 400 Emulsion Polymer**

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<b>Trade name</b>	<b>Product Type</b>	<b>Comments</b>
Ropaque™ Ultra	Hiding Agent	Opaque polymer providing greater economic value than Ropaque OP-96.
Skane™ M-8	Mildewcide	A mildewcide that provides excellent resistance to mildew growth without the use of lead- or mercury-containing compounds and without causing discoloration, cracking, or chalking. Most effective when used in formulations containing zinc oxide.
Tamol™ 850	Dispersant	A low-foaming dispersant that contributes significantly to the stability of architectural latex flat and sheen paints containing zinc oxide. Effective across a wide pH range.

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