ROHM AND HAAS

RHOPLEX™ WL-81 Waterborne Polymer For Industrial Lacquers

Description

RHOPLEX WL-81 thermoplastic, waterborne, acrylic polymer is specifically designed for the formulation of clear and pigmented ambient or forced-air-dry industrial lacquers. Coating systems based on this polymer are suitable for use on a variety of substrates and offer a number of key benefits currently provided by solventborne industrial lacquers, but without the flammability, odor, or other problems inherent with such systems.

Waterborne lacquers based on RHOPLEX WL-81 polymer have the following characteristics:

Formulation Benefits

- Low VOC
- Internal and precise viscosity control

Application Benefits

- Excellent spray characteristics
- Excellent dip-coat and flow-coat characteristics
- Rapid hardness development
- Fast set and tack-free time
- Dip tank stability

Performance Benefits

- Early water resistance
- Exterior durability
- Print and block resistance
- Salt spray resistance
- Humidity resistance
- Good gloss and image clarity
- Adhesion to substrates such as wood, pretreated steel, pretreated aluminum, and some plastics
- Compatibility with some water-reducible, epoxy-ester resins

Typical Physical Properties

These properties are typical but do not constitute specifications.

Appearance	Milky white liquid
% Solids by Weight	41.5
% Solids by Volume (theoretical)	39.3
Volatile Phase	Water
Brookfield Viscosity, cps., 25°C (#2 spindle @ 30 rpm)	40-500
pH	7.5
Minimum Film-forming Temperature, °C	57
T_{300}, °C	60
Density @ 2.5°C, lb/U.S. gal	8.6
Specific Gravity	1.036
Freeze/Thaw Stability (5 cycles, -15°C/70°F)	Pass
Mechanical Stability (5' Waring Blender)	Pass
Heat Stability (10 days/140°F)	Pass

Table I
General Performance Properties of Industrial Lacquers
(40/60 Pigment/Binder Ratio)

Property	RHOPLEX WL-81	Solventborne Alkyd
Gloss 20°/60°*	50/80	80/90
Dry to Touch	15 min.	10 min.
Zapon Tack-Free Time	35 min.	4 hr.
Hardness 1 wk. (KHN)	8	4
Durability	Excellent	Fair
Gasoline Resistance	Poor	Fair
Image Clarity	Good	Excellent
Reactive Pigment Stability	Can be formulated	Excellent
Freeze/Thaw Stability of Paint	Keep from freezing	Not applicable

*Dependent on type of formulation. One-week air-dry, Bonderite™ 40 panels, 1¼ mils.

Exterior Exposure

Table II contains information regarding the exterior exposure of a lacquer made with RHOPLEX WL-81 polymer in comparison to lacquers formulated with other vehicles. In addition to this information, extensive Weatherometer and QUV exposure data are available from your Rohm and Haas representative.

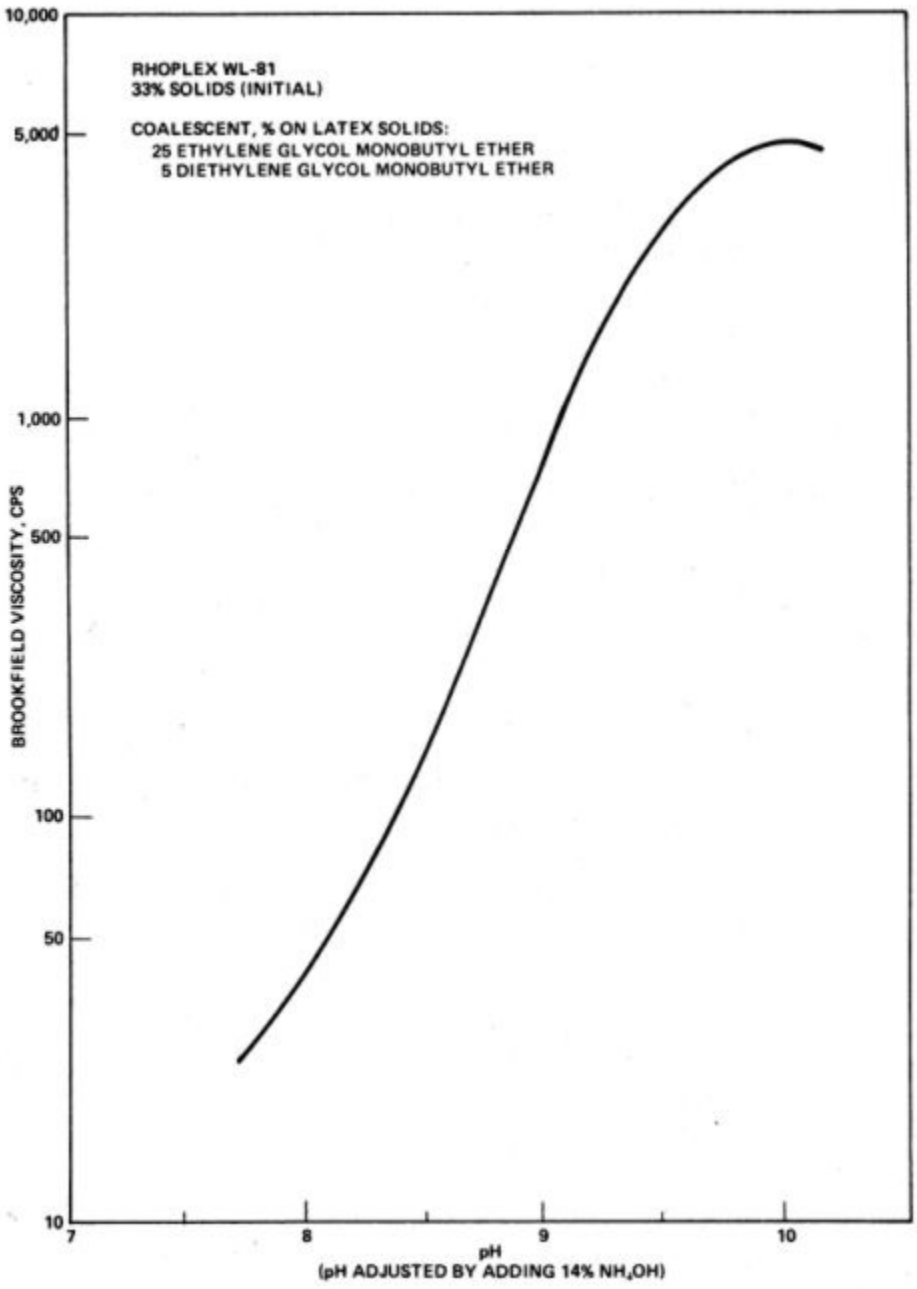
Table II
Exterior Exposure of Industrial Lacquers
(40/60 Pigment/Binder Ratio)

Vehicle	Initial Gloss 20°/60°	% Gloss Retained 20°/60°		Location
		6 Month	12 Month	
ACRYLOID™ B-48N	56/80	100/100	73/88	Newtown, PA
		75/86	30/50	Ocean City, NJ
		84/89	27/40	Florida
Water-reducible Alkyd	68/92	75/98	25/66	Newtown, PA
		85/100	23/55	Ocean City, NJ
		44/82	3/30	Florida
Competitive Styrenated Acrylic Copolymer	61/88	13/53	—	Newtown, PA
		10/33	—	Ocean City, NJ
		12/30	—	Florida
RHOPLEX WL-81	51/82	72/89	58/80	Newtown, PA
		61/86	29/59	Ocean City, NJ
		60/84	26.56	Florida

Viscosity Control

RHOPLEX WL-81 polymer is designed so that external thickeners are not required. Many of the glycol ethers on the market today will "swell" the latex particles, thereby increasing their effective volume and increasing the viscosity. The addition of ammonia or other amines (e.g., dimethylethanolamine) to the swollen particles will further increase viscosity. Typical examples of this effect are given in Figure I.

Figure I – RHOPLEX WL-81 – Typical pH/Viscosity Profile



The degree of swelling by various coalescents is illustrated in Figure II. The effect of the level of coalescent on viscosity response is shown in Figure III. The proper choice and level of coalescents combined with the use of ammonia or organic amine enable the formulator to control the viscosity response.

Pigmentation will also affect viscosity. Pigments with low-soluble ion concentration (e.g., Snowflake™ calcium carbonate extender) will reduce slightly the viscosity response to ammonia or other amines. Pigments with a higher soluble ion content (e.g., medium chrome and zinc yellow) will have larger effects. In formulating with these pigment types, the viscosity is more readily controlled by using a coalescent concentration/solids approach and depending less on pH response.

Figure II - RHOPLEX WL-81, Effect of Coalescent Type on Viscosity

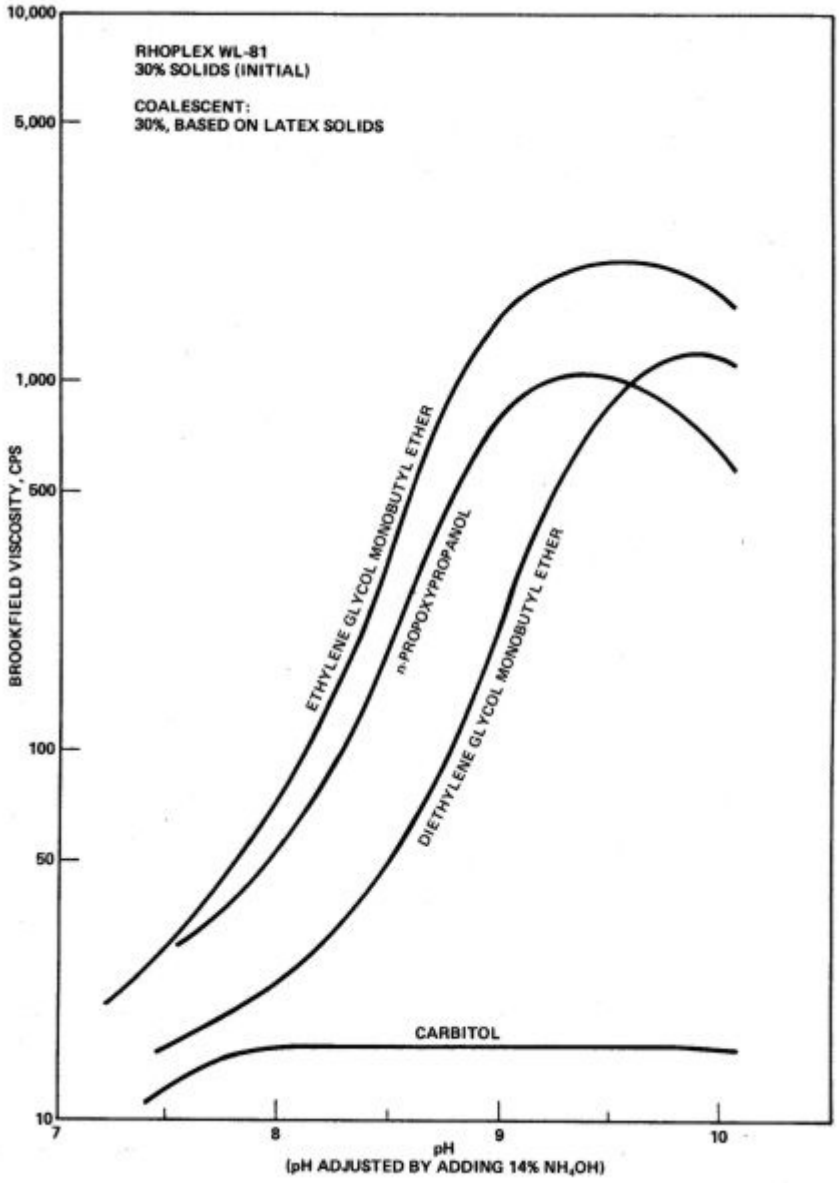
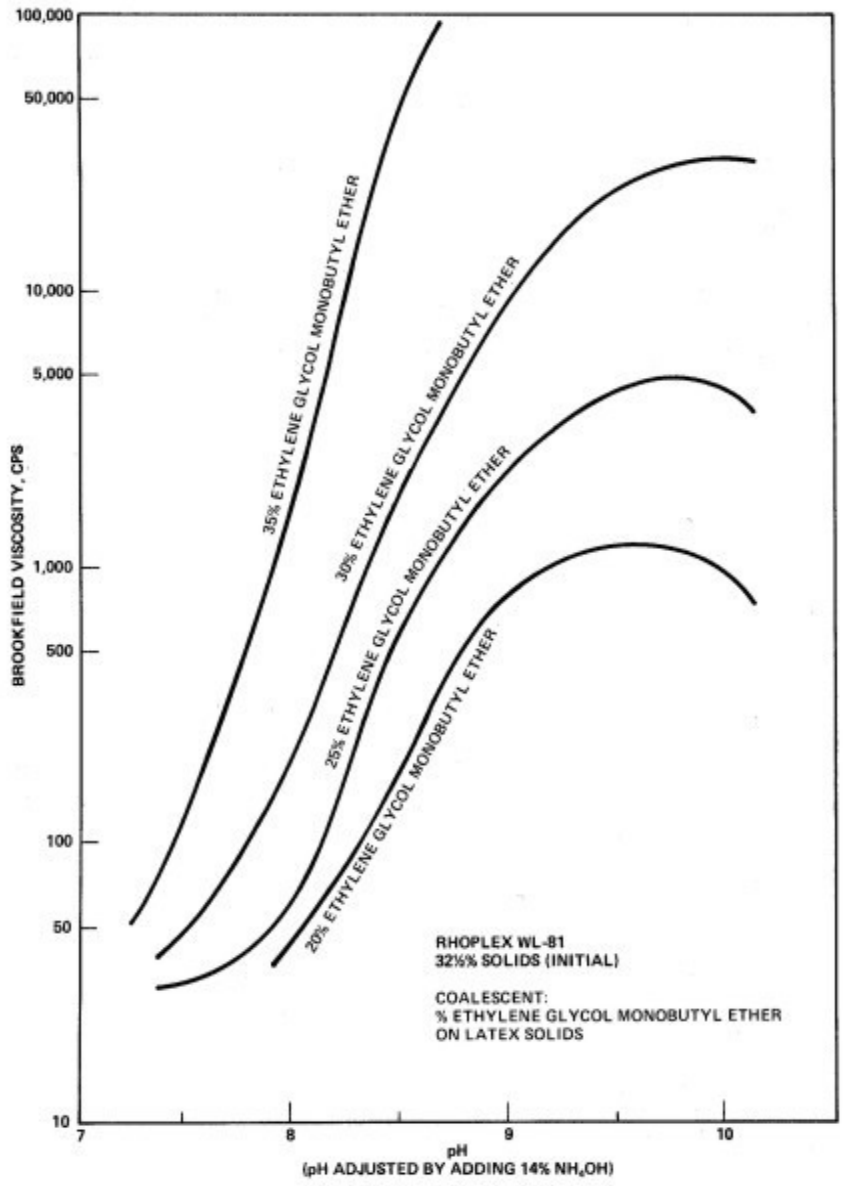


Figure III - RHOPLEX WL-81, Effect of Coalescent Concentration on Viscosity



Ambient Dry

In order to formulate high-gloss lacquers with an excellent balance of properties under air-dry conditions, proper selection of coalescing agents and/or plasticizers is a must. As with any latex system, care should always be taken to assure that adequate film formation at both extremes of the temperature and humidity scale is obtained. The use of a plasticizer such as PARAPLEX™ WP-1 in combination with the coalescents is a very efficient means of ensuring good film formation and providing a coating with an excellent balance of gloss and performance properties.

Forced Air-Dry

RHOPLEX WL-81 polymer can be formulated into high gloss, resistant lacquers which will develop full properties when forced air-dried for 15 to 30 minutes at a temperature between 150° and 200°F. Forced air-drying enables end users to obtain the through-put they currently have with high-temperature baking systems while conserving sufficient energy to maintain lines even during energy shortages which could shut down normal baking ovens.

Another advantage of forced air-drying is that it allows formulators to use lower amounts of coalescent than would be required under ambient drying conditions. This yields a further reduction in formulation costs. In dealing with lower coalescent levels, the coating should be forced air-dried before the film formation process has reached a critical stage. Failure to do this results in a coating with deficient properties. The flash-off time should be no greater than 10 to 15 minutes. If longer flash-off times are anticipated, additional coalescent should be included in the formulation.

Coalescents

The suggestions given in Table III are recommended starting point levels. The rate of hardness development, speed of dry, and application rheology can be carefully controlled by the proper selection of coalescent type and concentration. The final selection of coalescents and levels used are best determined through careful laboratory experimentation.

Table III

The following is a list of coalescents for use in lacquers based on RHOPLEX WL-81 polymer.

Preferred	
Ethylene glycol monobutyl ether	35-40%
Diethylene glycol monobutyl ether	4-10%
Alternate Packages	
1. Ethylene glycol monobutyl ether	25-30%
PARAPLEX WP-1	7.5-10%
2. Ethylene glycol monobutyl ether	50%
Texanol™	5%
PARAPLEX WP-1	10%
Additional Alternatives	
n-Propoxypropanol	
Phenyl Cellosolve	

Note: Rheology and film formation may be deficient under certain conditions (high humidity, low temperature, etc.).

Plasticizers

PARAPLEX WP-1 plasticizer may be incorporated into lacquers based on RHOPLEX WL-81 polymer to optimize the ambient-dry properties. The high MFT (minimum film-forming temperature) of this polymer coupled with its rapid coalescent release enables the end user to attain an excellent property balance with this plasticizer. The incorporation of the plasticizer also enables the formulator to attain a desirable lacquer hardness/flexibility balance. PARAPLEX WP-1 levels of 7.5-10.0% (on RHOPLEX WL-81 polymer solids) do not diminish the gloss, salt spray, or other key properties of lacquers based on RHOPLEX WL-81 polymer. Incorporation of the plasticizer decreases formulation coalescent demand, increases application solids and reduces emissions.

Applications Viscosity Control

Lacquers based on RHOPLEX WL-81 polymer should be adjusted to the proper viscosity for differing application methods—spray, dip, brush, etc.—without the use of external thickeners. This adjustment is best done by adding dilute solutions of ammonia (5 to 14%) to the lacquer slowly under mild agitation. If excess ammonia is added to the formulation and too high a viscosity results, simple reduction with water to the proper viscosity can recover the desired viscosity while only moderately lowering the solids content.

Neutralization with organic amines such as triethylamine or dimethylethanolamine is possible, but speed of dry will be sacrificed somewhat and the films will remain water-sensitive for a longer time. These amines are more applicable in situations in which sufficient force drying is available.

Flow and Mar-Resistant Agents

Dow Corning Paint Additive #14 can be included in lacquer formulations to minimize orange peel on spray application. The recommended levels are 0.3 to 0.5% on latex solids.

In developing the suggested formulations given in this brochure, BYK™-301 was employed as a mar aid. BYK-344 has also proven to be effective. Recommended levels are 0.3 to 0.5% on latex solids.

Defoamers

In developing the suggested formulations given in this brochure, Patcote™ 519 was the preferred defoamer to control foaming during pigment dispersion. Other defoamers found to be effective are Deefo™ 806-102 and Drew™ L-405. The recommended level of defoamer is 0.5 to 2.0 lb/100 gal as supplied.

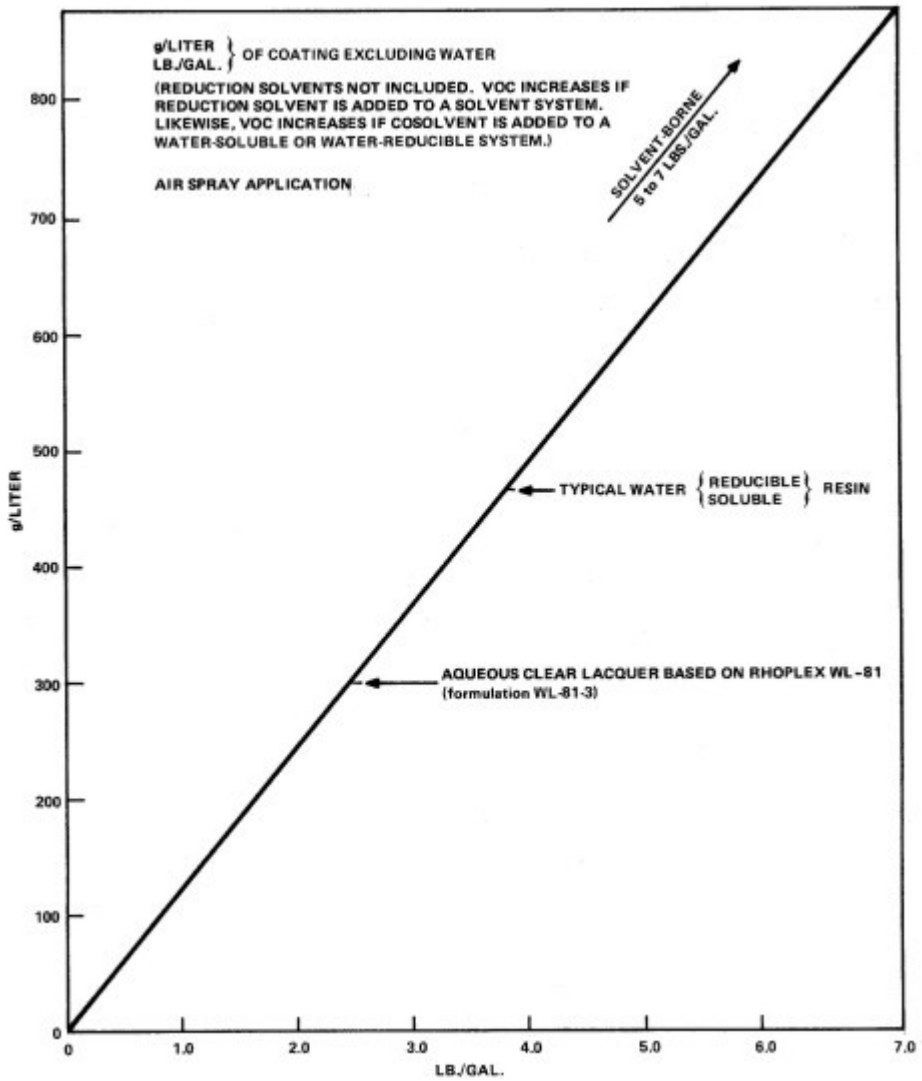
Formulations

RHOPLEX WL-81 polymer is supplied at 41.5% solids in water without cosolvent. This provides the formulator with maximum freedom and flexibility to design low emission ambient or forced air-dry aqueous lacquers with the best cost/performance balance for each application. In addition, lacquers based on RHOPLEX WL-81 polymer are adjustable to application viscosity with ammonia—without the use of external thickeners.

The following formulations are suggested for initial evaluations of RHOPLEX WL-81 polymer and were used to determine the typical properties presented in these notes.

The emissions situation for these formulations is illustrated in Figure IV. The low VOCs for lacquers based on RHOPLEX WL-81 polymer can be reduced even further by formulating with plasticizers, especially for applications in which low-temperature force-dry is available. Figure IV also provides a handy reference for converting gm/liter to lb/gal and vice versa.

Figure IV - VOC (g/Liter vs. Lb/Gal)



Formulation WL-81-1
Pigmented Lacquer Based on RHOPLEX WL-81 White

Materials	Weight Ratio[1]	Parts per Hundred (Volume Basis)
Add the following with good agitation:		
Water	40.0	4.8
TAMOL™ 165	10.8	1.3
Triton™ CF-10	1.4	0.2
Patcote 519	2.0	0.2
TiO_2	160.0	4.7
Cowles grind to 7–7½ N.S. Hegman. Then, add the following in order under agitation:		
Water	54.0	6.5
RHOPLEX WL-81	575.0	66.9
Ethylene glycol monobutyl ether	91.0	12.1
Diethylene glycol monobutyl ether	9.5	1.2
Patcote 519	1.0	0.1
BYK-301	1.2	0.1
Dow Corning Additive #14	1.2	0.1
Finally, add slowly under good agitation:		
	24.0	2.9
Hei-score™-XAB (10%)[2]	971.1	101.1
Formulation Constants		
pH	8.0 ± 0.3	
Viscosity, No. 4 Ford Cup, sec.	20 to 30	
Approximate Solids, % (wt., vol.)	41, 31	
Density, lb/gal	9.6	
TiO_2/Binder Ratio	40/60	
PVC, %	15	
Freeze/Thaw Stability	Protect from freezing	
Mechanical Stability (5' Waring Blender)	Satisfactory	
Heat Stability (10 days/140°F)	Satisfactory	
VOC, g/liter	285 (2.4 lb/gal)	
% on Polymer Solids		
Ethylene glycol monobutyl ether	38	
Diethylene glycol monobutyl ether	4	

[1] Using weight ratio in pound units will yield approximately 100 gallons of lacquer while with kilograms, 833 liters will result.
[2] 10% solution in water. Adjust pH with 14% ammonia.

Formulation WL-81-2
Pigmented Lacquer Based on RHOPLEX WL-81 Reactive Pigment

Materials	Weight Ratio[1]	Parts per Hundred (Volume Basis)
Add the following with good agitation:		
Water	45.0	5.6
TAMOL 165	10.8	1.3
Triton CF-10	1.4	0.2
Patcote 519	0.4	0.1
TiO_2	152.0	4.6
Strontium Chromate	8.5	0.3
Letdown as follows:		
Water	33.4	4.0
Surfactant XQS-20[2]	18.0	2.2
RHOPLEX WL-81	556.2	64.7
Ethylene glycol monobutyl ether	88.6	11.8
PARAPLEX WP-1[3]	17.5	2.1
Patcote 519	0.8	0.2
Add slowly under good agitation:		
	24.7	3.0
Hei-score-XAB (10%)[4]	957.3	100.1

Formulation Constants	
pH	8.0 ± 0.3
Viscosity, cps.	100 to 400
Approximate Solids, % (wt., vol.)	43, 32.5
Density, lb/gal	9.6
PVC, %	15
TiO_2/Binder Ratio	40/60
Freeze/Thaw Stability	Protect from freezing
Mechanical Stability (5' Waring Blender)	Satisfactory
Heat Stability (10 days/140°F)	Satisfactory
VOC, g/liter	220
lb/gal	1.83
% on Polymer Solids	
Ethylene glycol monobutyl ether	38.4
PARAPLEX WP-1	7.5

[1]Using weight ratio in pound units will yield approximately 100 gallons of lacquer while with kilograms, 833 liters will result.
[2]Reduced to 25% solids; pH adjusted to 8.5–9.0.
[3]If PARAPLEX WP-1 is not added as a premix, allow 1 to 2 days for the plasticizer to be absorbed by the latex.
[4]10% solution in water.

Formulation WL-81-3
Clear Lacquer Based on RHOPLEX WL-81

Materials	Weight Ratio*	Parts per Hundred (Volume Basis)
RHOPLEX WL-81	650.0	75.6
Water	110.0	13.2
Premix and add under agitation:		
Ethylene glycol monobutyl ether	103.8	13.8
Diethylene glycol monobutyl ether	10.8	1.4
BYK-301	1.3	0.2
Patcote 519	0.9	0.1
	876.8	104.3

To increase the lacquer viscosity add dilute ammonia solution consisting of 1 part concentrated ammonia (28%) and 1 part water. To decrease the lacquer viscosity thin with water.

Formulation Constants	
pH	7.5 ± 0.3
Viscosity, cps.	100 to 400
Approximate Solids, % (wt., vol.)	31, 29
Density, lb/gal	8.4
Freeze/Thaw Stability	Protect from freezing
Mechanical Stability (5' Waring Blender)	Satisfactory
Heat Stability (10 days/140°F)	Satisfactory
VOC, g/liter	304
lb/gal	2.53
% on Polymer Solids	
Ethylene glycol monobutyl ether	38.5
Diethylene glycol monobutyl ether	4.0

*Using weight ratio in pound units will yield approximately 100 gallons of lacquer while with kilograms, 833 liters will result.
This clear formulation can be used with Colanyl™ predispersed colorants to achieve various colors.

Formulation WL-81-4
RHOPLEX WL-81/Epotuf™ 38-690 (Epoxy Ester) Blend System
(Chromate Containing)

Materials	Weight Ratio[1]	Parts per Hundred (Volume Basis)
Epotuf 38-690	26.6	3.17
Aquacat™	1.0	0.12
Magnacat™	1.0	0.12
Ethylene glycol monobutyl ether	13.5	1.79
Mix well, then add in order:		
Triethylamine	2.3	0.39
Water	125.1	15.01
TAMOL 165	2.6	0.30
Patcote 550	0.5	0.07
Raven™ 2000	32.7	2.25
Oncor™ F-31[2]	9.7	0.29
Ball mill to 7½ N.S., add the following in order:		
Epotuf 38-690	144.1	17.16
Triethylamine	11.7	1.93
Water	125.1	15.01
Mix well (recheck grind) and add the following in order with good agitation:		
RHOPLEX WL-81	278.2	32.74
Triton X-405 (35% NV)	4.6	0.56
Santicizer™ 160	22.9	2.47
Water	31.3	3.77
Hei-score-XAB (10%)	23.2	2.90
	856.1	100.05
Formulation Constants		
Pounds/Gallons	8.6	
pH	8.9	
Viscosity, cps.	290	
Grind	7½	
Solids % (wt.)	35.3	
(vol.)	31.5	
Epotuf 38-690/RHOPLEX WL-81	51/49	
VOC (lb/gal)	1.52	
% on Polymer Solids		
Ethylene glycol monobutyl ether	27.5	
Santicizer 160	9.7	

[1]Using weight ratio in pound units will yield approximately 100 gallons of lacquer while with kilograms, 833 liters will result.

[2]Strontium Chromate can be used in place of the Oncor F-31.

Formulation WL-81-5
RHOPLEX WL-81/Epotuf 38-690 (Epoxy Ester) Blend System

Materials	Weight Ratio*	Parts per Hundred (Volume Basis)
Epotuf 38-690	26.7	3.18
Aquacat	1.0	0.12
Magnacat	1.0	0.12
Ethylene glycol monobutyl ether	13.5	1.80
Triethylamine	2.3	0.39
Water	125.4	15.05
TAMOL 165	2.6	0.30
Patcote 550	0.5	0.07
Raven 2000	32.8	2.25
Ball mill to 7½ + N.S., add the following in order:		
Epotuf 38-690	144.5	17.21
Triethylamine	11.7	1.93
Water	125.4	15.05
Mix well (recheck grind) and add the following in order with good agitation:		
RHOPLEX WL-81	279.1	32.84
Triton X-405 (35% NV)	4.7	0.56
Santicizer 160	23.0	2.48
Water	31.4	3.78
Hei-score-XAB (10%)	23.3	2.91
	848.9	100.04
Formulation Constants		
Pounds/Gallon	8.5	
pH	8.9	
Viscosity, cps.	330	
Grind	7½+	
Solids % (wt.)	34.5	
(vol.)	31.3	
P/B	11/89	
Epotuf 38-690/RHOPLEX WL-81	51/49	
VOC (lb/gal)	1.52	
% on Polymer Solids		
Ethylene glycol monobutyl ether	27.5	
Santicizer 160	9.7	

*Using weight ratio in pound units will yield approximately 100 gallons of lacquer while with kilograms, 833 liters will result.

Formulation WL-81-7
Clear Lacquer Based on RHOPLEX WL-81 with Zinc Yellow for Corrosion Resistance on Cold-Rolled Steel

Materials	Weight Ratio*	Parts per Hundred (Volume Basis)
RHOPLEX WL-81 (41.5 wt% solids)	488.3	56.8
Water	150.6	18.0
Triton X-405 (reduced to 35 wt% solids)	7.3	0.8
Zinc Yellow Slurry (10%), see below	30.3	3.3
Ethylene glycol monobutyl ether	101.1	13.5
Texanol	10.3	1.3
PARAPLEX WP-1	20.5	2.3
Hei-score-XAB (10%)	17.6	1.9
BYK-301	3.9	0.4
14% Ammonia to pH 9.0	14.6	1.7
	844.5	100.00

Formulation Constants	
pH	9.0
Viscosity, cps.	1000-1200
Approximate Solids, % (wt./vol.)	27.3/25.2
Density, lb/gal	8.45
Freeze/Thaw Stability	Protect from freezing
VOC, g/liter	334
lb/gal	2.78
Weight % on RHOPLEX WL-81 Solids	
Ethylene glycol monobutyl ether	50.0
Texanol	5.0
PARAPLEX WP-1	10.0

*Using weight ratio in pound units will yield approximately 100 gallons of lacquer, while with kilograms, 833 liters will result.

Zinc Yellow Slurry Formulation

Pounds	Component
10.0	Zinc Yellow (Heubach Y-539-D, zinc potassium chromate)
88.0	Water
2.0	Triton X-405
100.0	

Formulation WL-81-8
Flat Black Lacquer Based on RHOPLEX WL-81

Materials	Weight Ratio*	Parts per Hundred (Volume Basis)
Add the following with good agitation:		
RHOPLEX WL-81 (41.5 wt% solids)	612.1	71.19
Water	65.9	7.91
Colanyl Black PR-A	24.5	2.35
Mix well, then sift in:		
Syloid™ 166	18.8	1.13
Add the following with good agitation:		
	97.9	13.09
Ethylene glycol monobutyl ether Texanol	10.4	1.32
Ammonium Benzoate, 10 wt% in water	23.5	2.82
Deefo 806-102 (or Patcote 519)	1.4	0.19
	854.5	100.00
Note: If viscosity is too low, adjust up with 14% Ammonia. If viscosity is too high, adjust down with water.		
Formulation Constants		
pH	7.9-8.4	
Viscosity, cps	400-1000	
Approximate Solids, % (wt/vol)	31.0/28.7	
Density, lb/gal	8.5	
Freeze/Thaw Stability	Protect from freezing	
VOC, g/liter	330	
lb/gal	2.66	
Weight % on Polymer Solids		
Ethylene glycol monobutyl ether	38.6	
Texanol	4.1	

*Using weight ratio in pound units will yield approximately 100 gallons of lacquer while with kilograms, 833 liters will result.

Appendix

RHOPLEX WL-81 Polymer, Guidelines for General Industrial Formulating

Characteristics Which Affect Formulating Approach

A. Coalescents/Plasticizers

1. Ethylene glycol monobutyl ether is the most efficient coalescent.
2. RHOPLEX WL-81 polymer is hard (Tukon Hardness 12.0 KHN). For air-dry formulations some slow coalescent (e.g., 5-15% diethylene glycol monobutyl ether on latex nonvolatiles) is required for good film formation.
3. Coalescents affect the thickening response of RHOPLEX WL-81 polymer. We recommend checking the coalescent system in a clear formulation. This pH/viscosity profile will help to identify pigment interactions in a finished formulation.
4. PARAPLEX WP-1 is the preferred plasticizer.

B. Internal Thickening Mechanism

1. Ammonia or organic amines should always be added as final components and always added systems of relatively low viscosity.
2. Add ammonia and amines, preferably diluted with water, slowly and with good agitation.
3. If amine neutralization does not thicken a formulation adequately, minor increases in cosolvents, which swell the particle, can be added.

C. Pigmentation

Slurry pH is important since electrolytes can affect emulsion stability.

1. Prime Pigments

   a. Inorganic Prime Pigments

      Iron Oxide, Chromates, Molybdates.

      Any of these pigments can contribute ionic species to a latex formulation.

      Stability problems encountered with yellows (lead chromates) in formulations based on RHOPLEX WL-81 polymer can be overcome with stabilizing surfactants.

   b. Organic Toner Pigments

      Phthalos, Indanthrones, Quinacridones, Hansas, Toluidine.

      Selection is very important. Resinated types used in alkyd manufacture are not necessarily best for emulsions. Solubility in coalescents is important and solubility of metal salt types is important in high pH systems.

      Predispersed tints introduce dispersants, surfactants, and solvents which may affect performance.

      Phthalo and Hansas types work with ethylene glycol monobutyl ether/diethylene glycol monobutyl ether. However, two types of toluidine pigments used in the same system appeared to have a "bloom" effect.

2. Reactive Pigments

   RHOPLEX WL-81 polymer requires stabilization toward high concentrations of divalent ions. Whenever pigments such as chromates, borates, etc., are being used in a formulation, surfactants should be included to eliminate emulsion stability problems.

   A surfactant recommended for use with RHOPLEX WL-81 polymer is:

   Triton X-405—Usually cut to 35% nonvolatile with water before addition to the paint formulation.

3. Extenders

   a. Slurry pH is important.

   b. Calcium and barium ions can lead to stability problems. High PVC formulations will require a stabilizing surfactant.

   c. Examples of useful extenders are:

      (1) Fine-particle sized, low oil absorption pigments such as calcium carbonate or barytes are useful in dip and flow applications.

      (2) Talc extender with Busan™ 11-M1 is effective in promoting high-film build in spray applications.

      (3) Flatting Paste

	Weight Ratio[1]
Water	749.1
Triton X-100	2.0
Patcote 519	9.0
Amorphous Silica[2]	135.4
	895.5
Cowles grind to 5 N.S. minimum.	

[1]Using weight ratio in pound units will yield approximately 100 gallons or 833 liters.
[2]Example: Syloid 161

D. Pigmentation Levels/Dispersants and Dispersion

1. Prime Pigments

   a. Gloss—Use minimum pigment consistent with required hiding, e.g., TiO_2 systems require 15-16 PVC for 1.2–1.5 mils.

   b. Two-Coat Systems—Obtain hiding and holdout with the primer and use minimum pigment levels in the topcoat. Improvement in salt spray and humidity resistance is also obtained in formulations based on RHOPLEX WL-81 polymer by removing the Triton CF-10 and eliminating the ammonium benzoate from the topcoat formulation.

2. Dispersants and Dispersion

   a. We recommend low-acid-type dispersants such as TAMOL 165 along with a surfactant for pigment wetting (e.g., Triton CF-10, Igepal™ CTA-639).

   b. Levels—1–4 lb wetting aid/100 gal 10–15 lb dispersant/100 gal

   Note: In many formulations we recommend use of the cosolvent as a wetting aid for pigment. This is critical for difficult-to-wet pigments (e.g., blacks and organic types) and for some inorganics with small particle size and high oil adsorption.

   c. When water-soluble resins are used as dispersants (such as Arolon™ 557)—be aware that the coalescent demand of the latex can cause insolubility and possible flocculation of the water-soluble resin, when the resin is 11% or more of binder solids.

   d. Dispersion—For high-speed dispersers and sand mills, dispersant levels should be near the flow point to eliminate dilatent conditions.

   e. We recommend unmodified-type pigments for formulating (i.e., no resinated or solvent-type floc-resistant pigments). We prefer pebble or ball mill for difficult-to-disperse pigments. Sand mills and high-speed Cowles dispersers are satisfactory for TiO_2 and many other pigments.

E. Flash and Early Rust Prevention

1. The use of ammonia or a slow amine to adjust pH to a minimum of 8.1 is a very effective approach.

   The type and level of slow amine, if used, should be carefully determined to avoid decreasing the water resistance of the system.

2. Additives; such as, ammonium benzoate, sodium nitrate, etc., can be added to the system. Formulation for an ammonium benzoate solution:

	Parts by Weight
Water	938.3
Benzoic acid	100.0
Mix until dissolved, then add:	
28% Ammonium Hydroxide	102.3
	1140.6
pH of the solution should be 8.5 minimum.	

Raw Materials Supplier

Ingredient	Function	Supplier
ACRYLOID B-48N	Acrylic Resin	Rohm and Haas Company 100 Independence Mall West Philadelphia, PA 19106 (215) 592-3000
Aquacat	Drier	Ultra Adhesives Inc. P.O. Box 98 Park Station Paterson, NJ 07543 (201) 279-1306
Arolon 557	Water-reducible Acrylic Resin	Spencer Kellogg Division of Textron P.O. Box 807 Buffalo, New York 14240 (716) 883-7211
Bonderite	Test Substrate	Parker Chemical Company 32100 Stephenson Highway Madison Heights, MI 48071 (313) 583-9300
Busan 11-M1	Reactive Pigment	Buckman Laboratories, Inc. 1256 N. McLean Blvd. Memphis, TN 38108 (901) 278-0330
BYK-301 and BYK-344	Mar Aids	BYK-Mallinckrodt Melville, NY 11747 (516) 271-0763
Colanyl Colorant	Predispersed Pigment	American Hoechst Corp. Somerville, NJ 08876 (201) 685-3044
Deefo 806-102	Defoamer	Ultra Adhesives Inc.
Drew L-405	Defoamer	Drew Industrial Division One Drew Plaza Boonton, NJ 07005 (201) 263-7600
Epotuf 38-690	Water-reducible Epoxy-ester Resin	Reichhold Chemicals Inc. White Plains, NY 10603 (914) 682-5700
Hei-score-XAB	Ammonium Benzoate	Heico Div. Of Whittaker Corp. Delaware Water Gap, PA 18327 (717) 476-0353
Igepal CTA-639	Surfactant	GAF Corp. New York, NY (212) 621-5000
Magnacat	Drier	Ultra Adhesives Inc.
Oncor F-31	Reactive Pigment	NL Chemical P.O. Box 700 Highstown, NJ 08520 (609) 443-2000
Paint Additive #14	Flow and Leveling Aid	Dow Corning Corp. Midland, Ml 48640 (517) 496-4000
PARAPLEX WP-1	Plasticizer	Rohm and Haas Company
Patcote 519 Patcote 550	Defoamers	Patco Coatings Product Div. C.J. Patterson Co. Kansas City, MO 64111 (816) 561-9050
Raven 2000	Carbon Black Pigment	Columbian Chemicals Co. P.O. Box 300 Tulsa, OK (918) 586-2047

Santicizer 160	Plasticizer	Monsanto 800 N. Lindbergh Blvd. St. Louis, MO 63166 (314) 694-1000
Snowflake	Extender Pigment, Calcium Carbonate	Thompson, Weinman & Co. P.O. Box 130 Cartersville, GA 30120 (404) 382-5353
Syloid 161	Flatting Agent	W.R. Grace & Co. Davison Chemical Division Baltimore, MD 21203 (301) 659-9000
TAMOL 165	Surfactant	Rohm and Haas Company
Texanol	Coalescent	Eastman Chemical Products, Inc. P.O. Box 431 Kingsport, TN 37662 (615) 229-2000
Triton CF-10, X-100 and X-405	Surfactants	Dow Chemical USA Midland, MI 48674
Zinc Yellow Y-539-D	Reactive Pigment	Heubach, Inc. 256 Vanderpool Street Newark, NJ 07114 (201) 242-1800

Safe Handling Information

Based on its composition, RHOPLEX WL-81 polymer is not expected to be acutely toxic via single oral or dermal exposure. It may be a mild to moderate skin, eye, or respiratory irritant.

Certain chromate pigments mentioned in the formulating information in this bulletin are known animal carcinogens. We recommend that you obtain further information on the proper handling of these pigments from the suppliers.

Rohm and Haas Material Safety Data Sheets (MSDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products.

Under the OSHA Hazard Communication Standard, workers must have access to and understand MSDS on all hazardous substances to which they are exposed. Thus, it is important that you provide appropriate training and information to your employees and make sure they have available to them MSDS on any hazardous products in their workplace.

Rohm and Haas Company sends MSDS on non-OSHA hazardous as well as OSHA-hazardous products to both the "bill to" and "ship to" locations of all our customers upon initial shipment (including samples) of all our products (whether or not they are considered OSHA-hazardous). If you do not have access to one of these MSDS, please contact your local Rohm and Haas representative for an additional copy. Updated MSDS are sent upon revision to all customers of record. In addition, MSDS are sent on an annual basis to all customers of record.

MSDS should be obtained from your suppliers of other materials recommended in this bulletin.

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