

KAMICRYL PR SERIES Resin

Waterborne Acrylic Resin for Industrial Coatings

Description

KAMICRYL PR SERIES Resin is an aqueous acrylic emulsion polymer based on KAMICRYL PR SERIES Acrylic Resin Technology. It is an ambient temperature self-crosslinking polymer, and offers formulators a single resin which can be formulated into corrosion-resistant primers, highly durable topcoats, and high gloss direct-to-metal (DTM) finish coats. The novel technology behind the KAMICRYL PR SERIES Acrylic Resin product line leads to new standards in corrosion control, metal adhesion, film gloss, durability, and chemical and solvent resistance. One aspect of this technology is the formation of polymer-pigment composite particles, which results in a more homogeneous pigment distribution in the dry film, and coatings with better barrier properties, enhanced corrosion resistance and greater durability. The benefits of KAMICRYL PR SERIES Acrylic Resin Technology make KAMICRYL PR SERIES Resin a great match for both factory and field applied finishes for metal, concrete and masonry substrates.

Features and Benefits

- Excellent corrosion resistance
- Excellent water and blister resistance
- High gloss
- Excellent adhesion (especially to metal substrates, such as steel, galvanized steel or untreated aluminum)
- Excellent exterior durability
- Ambient self-crosslinking offers excellent chemical and solvent resistance
- APEO-free (made without the use of APEO surfactants)

Typical Physical Properties

These properties are typical but do not constitute specifications.

Property	Typical Values
Appearance	White milky liquid
Solids	45.0
pH	9.0
Viscosity (Brookfield, #3/30rpm)	<1000 cP
T _g	35°C
Density (lbs/gal)	8.80

Potential Applications

- Industrial Maintenance Finishes for steel and concrete
- Commercial Architectural Finishes for metal
- Institutional Coatings for concrete and masonry
- DIY Metal Coatings
- Basement Waterproofers
- General Industrial Finishes for metal
- Transportation Coatings (e.g., railcar, shipping containers)

Mechanism and Benefits of KAMICRYL PR SERIES Resin Technology

The benefits observed with coatings based on KAMICRYL PR SERIES Resin are partly due to its unique role in the film formation process. With a conventional acrylic latex polymer, the final paint film rarely displays an optimum distribution of pigment and extender particles throughout the film. Both in the wet state and as the film is drying, pigment and extender particles can aggregate together and form larger agglomerates. Keeping the pigment particles separated in the wet state is really the function of dispersants and surfactants, which adsorb to the pigment surface and provide both steric and electrostatic stabilization. Figure 1 shows how pigment agglomeration in a conventional acrylic coating can affect the structure of the final dry film, which will ultimately impact on film properties. Pigment-pigment interfaces of agglomerates can provide pathways for water and electrolytes to migrate through a film and reduce barrier properties, while bare pigment particles protruding from the film surface will affect surface roughness and gloss.

Poorly dispersed pigment leads to lower gloss and worse barrier properties than in an optimally dispersed system. KAMICRYL PR SERIES Resin solves the problem of pigment distribution in the wet and dry states by actually forming latex-pigment composites, where the latex associates with the surface of the pigment particles. This phenomenon is depicted in Figure 2, which shows a SEM micrograph of titanium dioxide particles dispersed in KAMICRYL PR SERIES Resin. The latex particles have adsorbed onto the pigment surface to form a composite particle. With a conventional acrylic binder, there is little to no association of the binder with the pigment surface. The formation of latex-pigment composites is not limited to titanium dioxide, but occurs with other mineral pigments as well, including typical extenders such as calcium carbonate, nephelinsyenite, and silica, and color pigments such as iron oxides. The latex-pigment composites help to keep the pigment and extender particles separated in the wet paint and provide a more optimal distribution of pigment in the dry film, because the latex particles act as spacers between pigment particles.

Figure 1. Mechanism of film formation for a pigmented coating based on a conventional acrylic latex

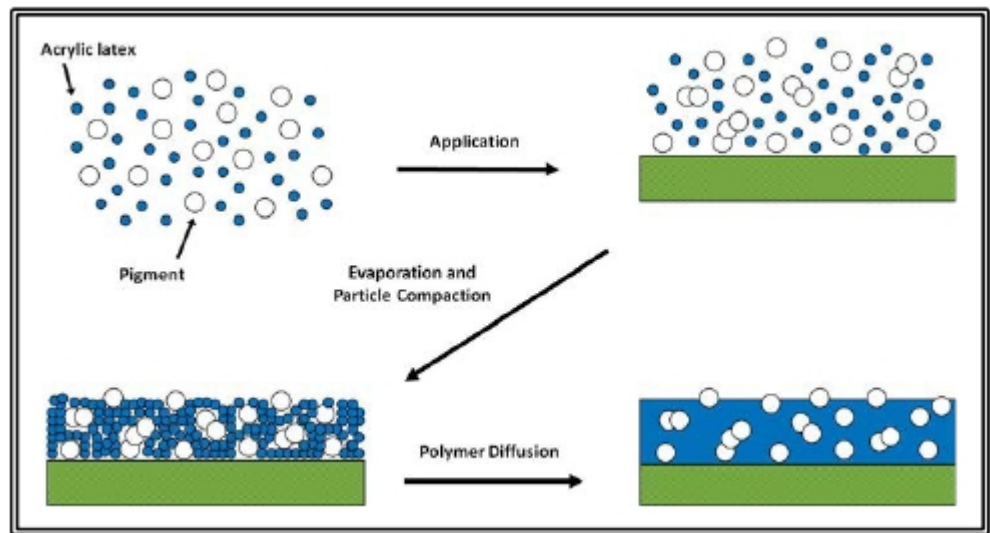
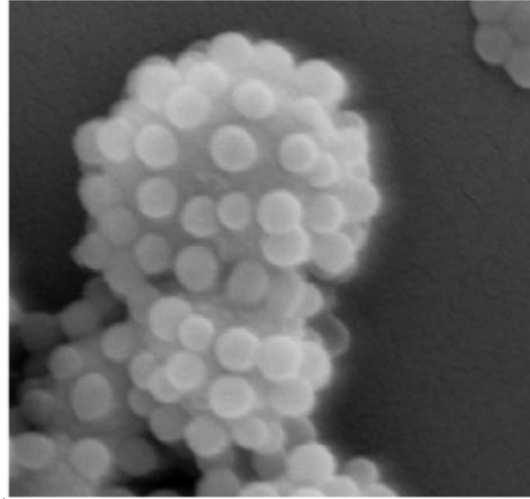


Figure 2. SEM micrograph (x100K) of a latex-pigment composite particle formed by KAMICRYL PR SERIES Resin and titanium dioxide.



The effect of the KAMICRYL PR SERIES Resin Technology on the film formation process is shown in Figure 3. The composite particles form in the wet state, as the paint is being made. As the film dries, the adsorbed latex acts as a spacer to keep the pigment particles separated. The surface of the film is also rich in binder compared to the conventional acrylic because each pigment particle is already surrounded by a layer of latex. The result is higher gloss due to a smoother, binder rich surface, better hiding due to better spacing of the titanium dioxide, and improved barrier properties (e.g., corrosion resistance) due to fewer pigment-pigment interfaces. Improvements in exterior durability relative to conventional acrylics are also observed, and thought to be due to the improved dispersion of UV-absorbing pigments such as TiO₂ throughout the film. Better dispersion of such pigments in a matrix of KAMICRYL PR SERIES Resin will prevent UV light from penetrating deep into the film and directly degrading the polymer matrix via a photolytic process (Figure 4).

Figure 3. Mechanism of film formation for a pigmented coating based on an KAMICRYL PR SERIES Resin

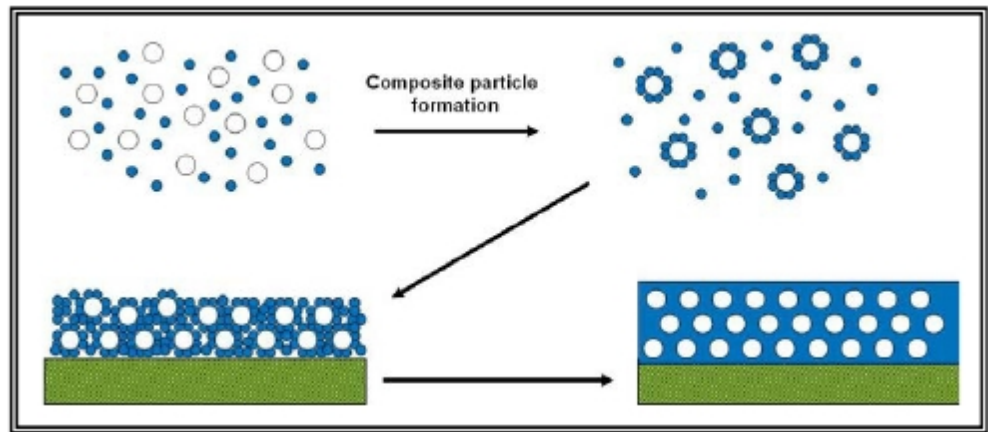
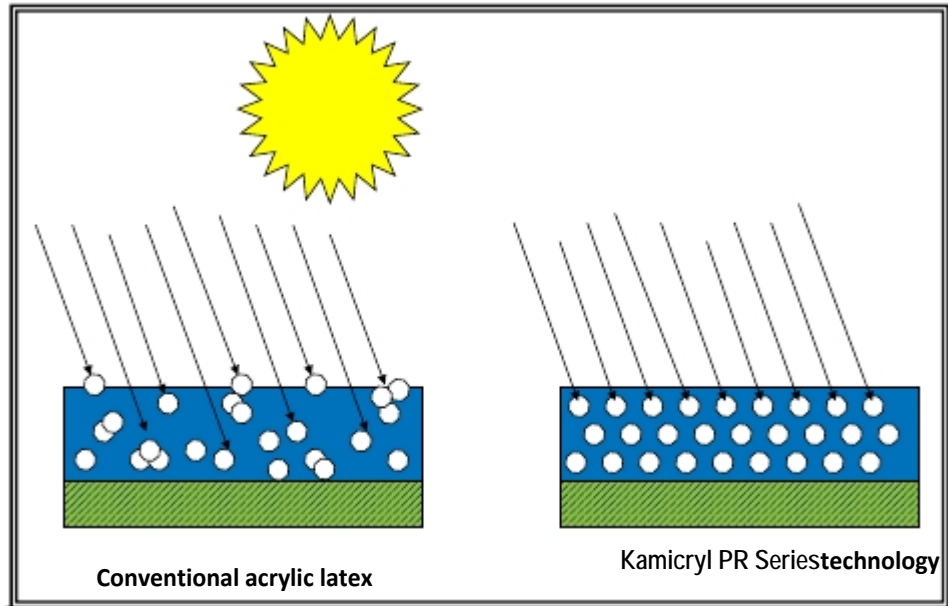


Figure 4. Proposed mechanism for improved UV light durability. Better dispersion of UV-absorbing pigments such as TiO₂ prevent UV light from penetrating deeply into the film.



Another key feature of KAMICRYL PR SERIES Resin is its ability to self-crosslink at ambient temperatures and still maintain true one-package stability. The functional groups present in the resin crosslink via both oxidative and photolytic curing mechanisms. Formulations based on KAMICRYL PR SERIES Resin will begin to crosslink after film formation, and may require about 2 to 4 weeks under laboratory conditions until some properties have reached their maximum performance level. Exposure to UV light will accelerate the crosslinking process. The crosslinked film provides improved dirt pickup resistance, chemical and solvent resistance, and further enhances durability.

Performance Data

KAMICRYL PR SERIES Resin has been evaluated in several types of coatings applications, including direct to metal (DTM) finish coats and anti-corrosive primers designed for metal surfaces, and concrete and masonry coatings such as basement waterproofers for below-grade interior concrete and block walls. The results described below demonstrate that KAMICRYL PR SERIES Resin is a versatile binder and displays high performance in a variety of demanding applications.

The typical performance of KAMICRYL PR SERIES Resin in a gloss white DTM finish is described in Table 1, where it is compared to a commercial styrene-acrylic DTM binder based on conventional acrylic technology. The conventional acrylic used in this study had a similar glass transition temperature of 35°C. Both binders were formulated into the same 16% PVC / 36% VS gloss white formula with 15% Texanol ester alcohol coalescent (% on polymer solids), to yield a calculated VOC of approximately 125 g/L (see Formulation 200-1). KAMICRYL PR SERIES Resin shows the expected benefits of higher gloss potential, improved adhesion, and better gloss retention compared to the conventional binder.

In a gloss white formulation, 60° gloss values with KAMICRYL PR SERIES Resin are typically in the range of 75 – 85 units, and will depend on formulation variables such as PVC and TiO₂

Table 1. Comparison of film properties for KAMICRYL PR SERIES Resin and a conventional acrylic in a 16 PVC gloss white DTM formulation.

	KAMICRYL PR SERIES Resin	Conventional Acrylic
PVC / VS	16.0% / 36.4%	16.0% / 36.5%
Stormer Viscosity (KU)	97	91
ICI Viscosity (poise)	1.0	1.1
pH	9.4	8.9
Film Properties:		
Gloss (20°/60°)	50 / 75	29 / 66
Konig hardness (2 week)	26.6 sec	31.1 sec
Pencil hardness (2 week)	HB	HB
Block resistance¹		
<i>1 day dry</i>		
24 hr at RT	3	4
30 min at 60°C	5	3
<i>7 day dry</i>		
24 hr at RT	7	8
30 min at 60°C	6	8
Adhesion (dry / wet, ASTM D3359)		
Cold rolled steel	5B / 2B	5B / 0B
Galvanized steel	5B / 5B	5B / 0B
Untreated aluminum	5B / 5B	5B / 0B
Scrub resistance (ASTM D2486)	740	410
Gloss retention (60° gloss on UV-A exposure)²		
Initial	76	70
2 week	73 (96%)	52 (74%)
4 week	67 (88%)	43 (61%)
Stain removal (% removal)		
Pencil	65	30
Blue Pen	50	25
Red China marker	95	95
Red lipstick	85	100
Purple crayon	95	95
Coffee	100	100
Tea	95	100
Grape Juice	90	100
Mustard	80	95

Notes: 1) Block resistance rated on a 1 to 10 scale, 10 = best. Coatings were dried for either 1 or 7 days before being subjected to the room temperature or 60°C block test. 2) Weathering cycle consisted of 4 hrs UV light at 60°C and 4 hrs condensation at 50°C.

grade. However, compared to a conventional latex, gloss potential is higher due to the smoother surface resulting from the presence of the pigment-polymer composites, as described in Figure 3. The higher gloss potential is achieved without the need to lower molecular weight, a tactic often used to increase gloss but one which has a negative effect on aesthetic durability and chemical resistance. As shown in Table 1, gloss retention of KAMICRYL PR SERIES Resin is excellent in accelerated UV-A weathering. Gloss retention of a similar 15 PVC gloss white DTM formulation is compared in Figure 5 to two commercial DTM coatings. The commercial DTM coatings are based on conventional acrylic technology, with one based on a self-crosslinking acrylic resin. The KAMICRYL PR SERIES formulation performs much better than the commercial DTM coatings out to 1500 hrs UV-A exposure. As expected, the conventional self-crosslinking DTM performed better than the technology without crosslinking, but it was still not the equal of KAMICRYL PR SERIES. KAMICRYL PR SERIES has the advantage of both a more optimal dispersion of the TiO₂ (Figure 4) and self-crosslinking to aid in improved durability. Results of exterior exposure corroborate the excellent durability of KAMICRYL PR SERIES. Figure 6 compares KAMICRYL PR SERIES in an 18 PVC gloss white DTM to a conventional acrylic in the same formulation, as well as a commercial two-component solventborne polyurethane. After two years of south 45° exposure at a site in eastern Pennsylvania, the coating based on KAMICRYL PR SERIES is outperforming even the two-component polyurethane, which is recommended for high performance industrial maintenance applications.

The excellent corrosion resistance of KAMICRYL PR SERIES is demonstrated in Figures 7 and 8. Figure 7 shows panels after salt spray exposure (ASTM B117) of 192 and 504 hrs, coated with 16 PVC gloss white DTMs based on KAMICRYL PR SERIES and a conventional acrylic DTM binder in Formulation 200-1. Even without corrosion inhibiting pigments, KAMICRYL PR SERIES performed very well over smooth cold rolled steel after 500 hrs exposure. Figure 8 shows results of 336 hr salt spray testing for 9 PVC gloss yellow DTMs (Formulation 200-3) based on KAMICRYL PR SERIES and another conventional acrylic DTM binder. In this case, the films were applied at 3 mils DFT over blasted hot rolled steel, and again the performance of KAMICRYL PR SERIES was exceptional. Compared to conventional acrylics, the improved corrosion resistance

Figure 5. Gloss retention of gloss white coatings in accelerated UV weathering (UV-A bulbs), comparing KAMICRYL PR SERIES in a 15 PVC gloss white DTM with commercial acrylic DTM coatings.

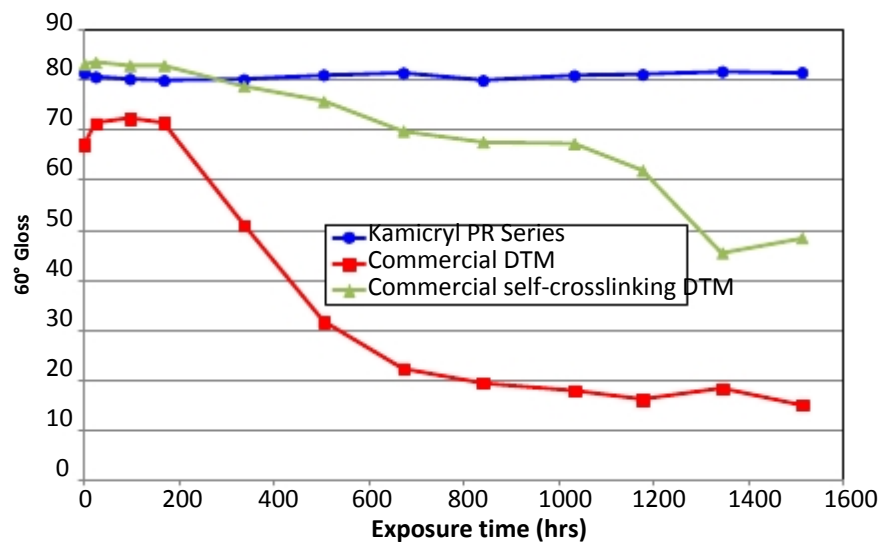


Figure 6. Gloss retention of gloss white coatings on exterior exposure (south 45°)

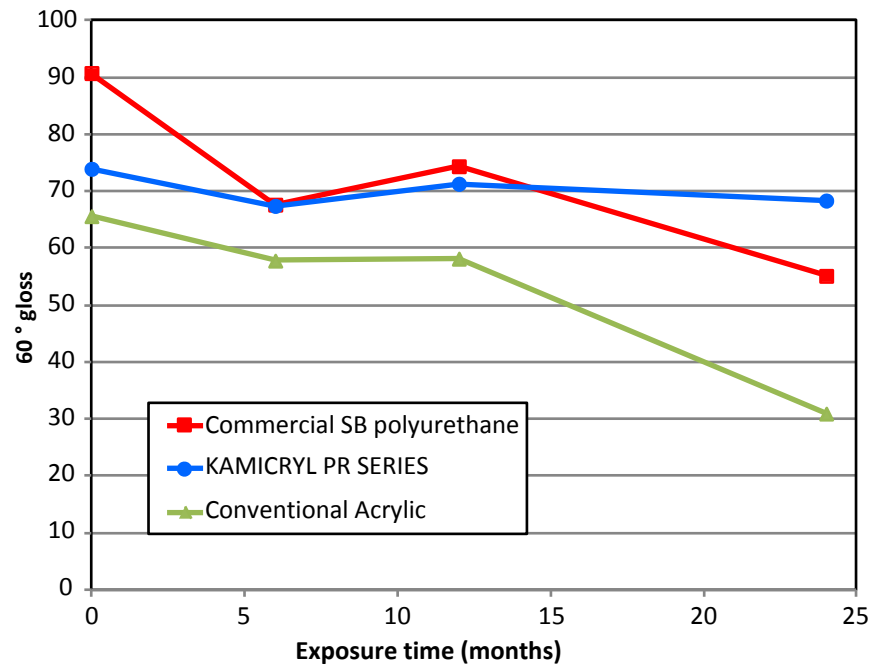
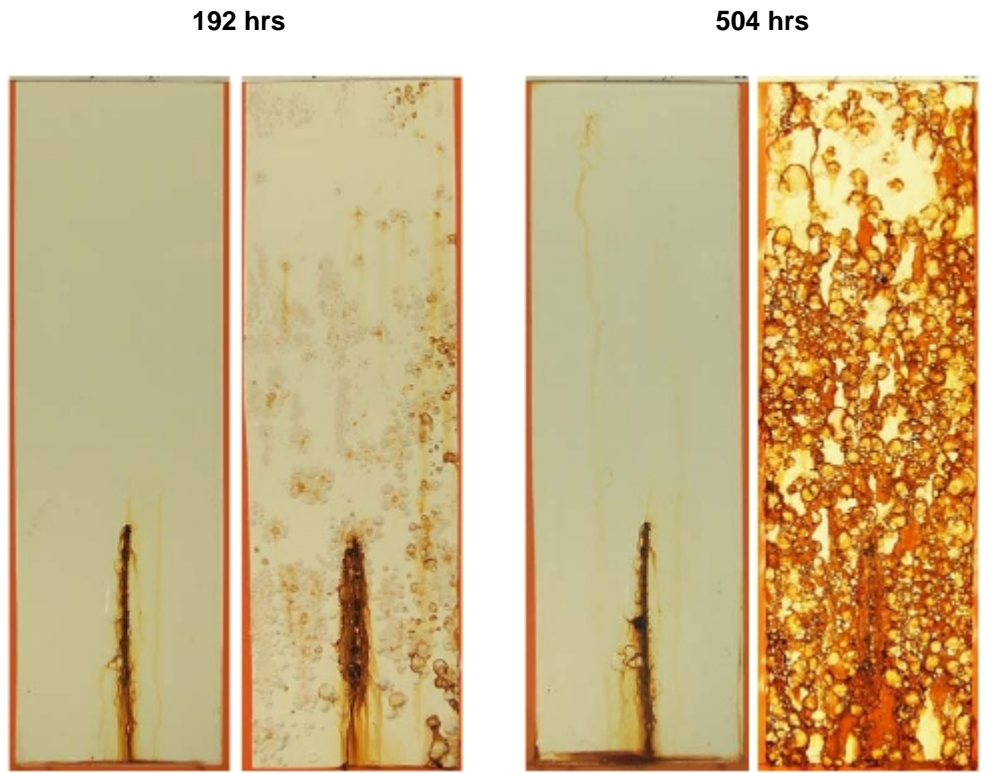


Figure 7. Salt spray resistance at 192 and 504 hrsexposure for 16 PVC gloss white DTM formulations applied at 2.2 mils DFT on cold rolled steel.



KAMICRYL PR SERIES Resin Conventional acrylic KAMICRYL PR SERIES Resin Conventional acrylic

Figure 8. Salt spray resistance at 336 hrs exposure for 9 PVC gloss yellow DTM formulations applied at 3.0 mils DFT on blasted hot rolled steel.



of KAMICRYL PR SERIES Resins is due in part to the better dispersion of pigments in the dry film which provides a film with better barrier properties, and likely also due in part to better adhesion over metal. The adhesion of KAMICRYL PR SERIES is described in Table 1, which shows a key benefit of the technology over difficult substrates such as galvanized steel and untreated aluminum.

In addition to its excellent performance over metal, KAMICRYL PR SERIES has been shown to be very suitable for use over concrete and masonry substrates. Due to its hydrophobic composition and small particle size, it displays very good water resistance. It has been evaluated in a 46 PVC masonry waterproofer formulation (Formulation 200-5) and compared to a commercial acrylic waterproofer for resistance to hydrostatic pressure (ASTM D7088) on concrete blocks. Results of this study are detailed in Table 2. The commercial waterproofer failed at 4 psi, whereas the coating based on KAMICRYL PR SERIES passed at 10 psi. Formulation 200-5 is designed for use in masonry and concrete applications, including below-grade interior basement waterproofer.

Formulating Guidelines

General Considerations when formulating with KAMICRYL PR SERIES Resins

Formulations containing KAMICRYL PR SERIES Resins can generally be prepared using similar techniques as with conventional acrylics. However, because the latex particles have an affinity for and adsorb to inorganic pigment surfaces, there are some procedures that should be followed to avoid possible stability problems and formation of grit or gel during manufacture. In general, slow addition of the pigment dispersion to the latex should be done during the letdown in order to avoid high concentrations of "bare" pigment. This procedure helps avoid bridging of pigment particles by adsorbing latex, which could result in

Table 2. Film properties of KAMICRYL PR SERIES Resin in a below grade masonry waterproofer formulation, and comparison with a commercial waterborne acrylic waterproofer.

	KAMICRYL PR SERIES Resin	Commercial Waterproofer
PVC / VS	46.4% / 40.1%	unknown
Stormer Viscosity (KU)	132	137
pH	8.8	8.5
Film Properties:		
Gloss (60°/85°)	3.6 / 0.7	2.3 / 0.2
Resistance to Hydrostatic Pressure (ASTM D7088)		
4 psi	Pass	Fail
10 psi	Pass	Not tested

viscosity instability and grit, and leads to more optimal formation of the composite particles. Good agitation is also essential during the letdown procedure to avoid areas of high pigment concentration and “dead zones” within a tank where material undergoes poor mixing. Tank and mixing blade configuration can also contribute to poor mixing, and should be considered before moving to full scale manufacturing. Dilution of the pigment dispersion with free water or co-solvent before addition can also aid in lowering the localized pigment concentration. Because composite particle formation can take varying amounts of time depending on formulation ingredients, it is recommended that pigmented coatings are mixed for approximately 30 to 60 minutes after the final ingredients have been added.

KAMICRYL PR SERIES Resin can be formulated with common additives available for waterborne coatings. However, because of the crosslinking technology used in this emulsion, additives that contain or release formaldehyde are not recommended in combination with KAMICRYL PR SERIES. In addition, application of coatings based on KAMICRYL PR SERIES should not be made to substrates that release formaldehyde. The use of such materials or substrates may cause slight yellowing of the film and potential degradation of film properties.

Coalescents

Depending on drying conditions and application methods, the proper selection of a coalescent package is critical to obtaining optimum properties for coatings based on KAMICRYL PR SERIES. Texanol ester alcohol at approximately 15% on polymer solids is a good starting point for coalescent choice. Optifilm 400 Film Enhancer can be utilized as a non-volatile coalescent in order to lower VOC. Faster coalescents such as DOWANOL™ DPM Glycol Ether and Butyl CELLOSOLVE™ Glycol Ether can be used to provide faster hardness development, but are less efficient at lowering MFFT compared to Texanol. Care should be taken in adding coalescents to the letdown to avoid shocking the latex. Add coalescents slowly to avoid the formation of grit or gel, particularly when at lower pH values. Dilution of water-miscible coalescents and inclusion of coalescents in the pigment dispersion are two methods that can also be used to avoid grit formation.

Dispersants

Because KAMICRYL PR SERIES resin interacts closely with the pigment and extender particles, the choice of pigment dispersant is critical. Copolymer dispersants such as TAMOL™ 165A and TAMOL 681, or the low VOC alternative TAMOL 2002, at 1 to 2% solids on pigment solids are recommended as starting points. Surfynol CT-111 has also been used successfully as a co-dispersant. In general, polyacrylic acid and polymethacrylic acid

dispersants are not good choices, as they can reduce corrosion resistance, as well as inhibit composite particle formation. High levels of dispersant should also be avoided, as that can also inhibit composite particle formation, as well as increase water sensitivity and lower corrosion resistance.

Titanium Dioxide

Both dry and slurry grades of titanium dioxide have been used successfully with KAMICRYL PR SERIES Resin. Highly durable grades such as Ti-Pure R-706 and Ti-Pure R-746 are recommended for best gloss and exterior durability in topcoats and DTMs. For white and grey primers, a less durable grade such as Ti-Pure R-900 can be used. KAMICRYL PR SERIES Resin will interact in a slightly different manner depending on TiO₂ grade and surface chemistry, so laboratory testing should be carried out to ensure good stability and performance.

Other Pigments and Extenders

KAMICRYL PR SERIES Resin will interact and form composite particles with a variety of common inorganic pigments and extenders, such as iron oxides, calcium carbonates, silicas, talcs, and nephelinsyenite. When formulating with KAMICRYL PR SERIES, one needs to take into account the total amount of pigment surface area onto which the latex could adsorb. If there is not enough latex to cover all available pigment surfaces, bridging between pigment particles could occur, and result in viscosity instability and grit. Extender pigments tend to have large particle size and low surface areas compared to color pigments such as TiO₂, so instability is not common except at high PVC levels. In general, stability should be monitored when developing formulations at PVC levels above approximately 35 – 40%.

Defoamers

Foam is a major concern in waterborne coating formulation design. Defoamers are needed to eliminate foam during manufacture and film application. Suitable defoamers for KAMICRYL PR SERIES include Tego Foamex 1488, Drewplus L-493, BYK-022 and Foamaster 111. Tego Airex 902W at 0.5 – 1.0% by weight as supplied on total formulation has been found to assist in reduction of microfoam during spray application.

Wetting and Mar Aids

The addition of a wetting surfactant such as Surfynol 104DPM or TRITON™ CF-10 provides good surface wetting and reduces the tendency for formulations based on KAMICRYL PR SERIES Resin to crater or picture frame. The addition of BYK 333 and Tego Glide 410 offer excellent mar and slip resistance at levels of approximately 0.5–1% on polymer solids.

Viscosity Control

Nonionic HEUR rheology modifiers, such as ACRY SOL™ RM-8W, ACRY SOL RM-12W and ACRY SOL RM-2020NPR Rheology Modifiers are key to formulating a high quality, corrosion-resistant coating. The use of cellulose or alkali-soluble thickeners can significantly degrade corrosion resistance when formulating waterborne coatings for metal substrates. The expected method of application is an important parameter to consider when selecting rheology control agents. Brushing formulations require higher viscosity under high shear conditions for the best brush drag and film build, and suitable rheology modifiers include ACRY SOL RM-5000 and ACRY SOL RM-2020NPR. To increase the Storrer viscosity of a coating, ACRY SOL RM-8W, ACRY SOL RM-825 and ACRY SOL SCT-275 are efficient thickeners. Low shear viscosity, which affects sag resistance, can be increased using ACRY SOL RM-12W or ACRY SOL RM-995. Often a coating is used with various application methods such as airless spray and brush. Having a coating that provides optimum rheology for both brush and spray application can be difficult, and having a rheology profile of approximately 90 KU / 1.0 poise is a starting point for a compromise of

low shear and high shear viscosity. To attain this rheology, it may be necessary to utilize more than one of the above thickeners.

Flash Rust Inhibitors

In waterborne coatings designed for steel substrates, the aqueous phase should contain flash rust inhibitors to prevent the rapid rusting (flash rust) that can occur as the coating is drying. The recommended additive is sodium nitrite (NaNO_2), which is effective at low use levels of 1 to 2 lbs/ 100 gallons. Addition in a diluted form (15% aqueous solution) is recommended to prevent stability problems and grit formation. Commercial flash rust inhibitors are also available, such as Halox Flash-X 150, Halox 570 or Raybo 60, and are also suitable for use with KAMICRYL PR SERIES.

Anti-corrosive Pigments

Anti-corrosive pigments, also known as reactive or inhibitive pigments, are often used in primer formulations to improve corrosion resistance. The level and type of these pigments can have a strong effect on paint stability due to their partial solubility and the presence of multivalent ions such as Zn^{+2} , so these pigments should be thoroughly evaluated for compatibility. Halox SZP-391 and Heucophos ZCPP have been successfully used with KAMICRYL PR SERIES at levels of approximately 50 lbs/ 100 gallons. Lower levels of anti-corrosive pigments are sometimes used in DTM finishes, but can have a negative impact on gloss levels due to the particle size of the inhibitive pigment.

Gloss white DTM finish based on KAMICRYL PR SERIES Resin

Material Name	Pounds	Gallons
Grind		
Water	50.00	5.98
Ammonia (28%)	1.00	0.13
TAMOL™ 681 Dispersant	8.36	0.92
TRITON™ CF-10 Surfactant	1.50	0.17
Tego Foamex 1488 defoamer	1.00	0.12
Ti-Pure R-706 titanium dioxide	195.00	5.84
Grind Subtotal	256.86	13.17
Letdown		
KAMICRYL PR SERIES	641.00	72.84
Water	43.50	5.20
Ammonia (15%)	4.00	0.51
<i>Add grind from above with good agitation</i>		
Texanol ester alcohol	43.27	5.46
Tego Foamex 1488 defoamer	1.00	0.12
Sodium nitrite (15%)	9.00	0.99
ACRYSOL™ RM-5000 Rheology Modifier	15.00	1.72
Totals	1013.62	100.00
Levels without Additives:	Volume Solids:	36.4%
	Weight Solids:	47.7%
	PVC:	16.0%
	Density (lb/gal):	10.1
	VOC (g/L):	126
Levels with Additives:	Volume Solids:	37.3%
	Weight Solids:	48.6%

Gloss white DTM finish based on KAMICRYL PR SERIES Resin

Material Name	Pounds	Gallons
Grind		
Water	50.08	6.00
Ammonia (28%)	2.00	0.27
TAMOL™ 2002 Dispersant	7.15	0.81
Surfynol CT-111 surfactant	2.00	0.25
BYK-022 defoamer	1.00	0.12
Colortrend 888-9907B lampblack colorant	0.30	0.03
Ti-Pure R-706 titanium dioxide	200.00	5.99
Grind Subtotal	262.54	13.46
Letdown		
KAMICRYL PR SERIES	578.00	65.68
Water	112.84	13.52
<i>Add grind from above with good agitation</i>		
Texanol ester alcohol	39.00	4.92
Sodium nitrite (15%)	9.00	0.99
ACRYSOL™ RM-2020NPR Rheology Modifier	12.00	1.43
Totals	1013.38	100.00
Levels without Additives:		
	Volume Solids:	33.6%
	Weight Solids:	45.4%
	PVC:	17.9%
	Density (lb/gal):	10.1
	VOC (g/L):	118
Levels with Additives:		
	Volume Solids:	34.6%
	Weight Solids:	46.4%

Gloss yellow DTM finish based on KAMICRYL PR SERIES Resin

Material Name	Pounds	Gallons
Grind		
Water	31.06	3.72
DOWANOL™ DPM Glycol Ether	20.04	2.52
Ammonia (28%)	1.00	0.13
TAMOL™ 681 Dispersant	6.01	0.66
TRITON™ CF-10 Surfactant	2.00	0.23
BYK-022 defoamer	2.00	0.24
Bayferrox 1420M yellow iron oxide	61.61	1.76
Ti-Pure R-706 titanium dioxide	51.59	1.55
Grind Subtotal	175.32	10.81
Letdown		
KAMICRYL PR SERIES	701.67	79.73
Ammonia (15%)	2.51	0.32
<i>Add grind from above with good agitation</i>		
BYK-024	2.00	0.24
TegoAirex 902W	5.01	0.59
Texanol ester alcohol	31.57	3.98
Butyl CARBITOL™ Glycol Ether	15.79	1.98
Sodium nitrite (15%)	10.02	1.10
Ammonia (15%)	0.84	0.11
Water	4.51	0.54
ACRYSOL™ RM-12W Rheology Modifier	4.27	0.49
ACRYSOL RM-8W	0.89	0.10
Totals	954.39	100.00
Levels without Additives:	Volume Solids:	36.8%
	Weight Solids:	45.0%
	PVC:	9.0%
	Density (lb/gal):	9.5
	VOC (g/L):	177
Levels with Additives:	Volume Solids:	38.0%
	Weight Solids:	46.2%

Light grey anti-corrosive primer based on KAMICRYL PR SERIES Resin

Material Name	Pounds	Gallons
Grind		
Water	136.52	16.36
Methyl CARBITOL™ Glycol Ether	22.42	2.63
TAMOL™ 165A Dispersant	25.34	2.87
Surfynol 104DPM surfactant	2.01	0.24
Tego Foamex 1488 defoamer	0.48	0.06
Ammonia (28%)	0.98	0.13
Ti-Pure R-900 titanium dioxide	58.51	1.75
Imsil A-10 silica	78.01	3.53
Talcron MP30-36 talc	78.01	3.44
Halox SZP-391	48.76	1.94
ACRYSOL™ RM-5000 Rheology Modifier	2.77	0.32
Cab-O-Sil M-5 fumed silica	2.35	0.13
Grind Subtotal	456.17	33.39
Letdown		
KAMICRYL PR SERIES	514.86	58.51
Tego Foamex 1488 defoamer	0.48	0.06
<i>Add grind from above with good agitation</i>		
Texanol ester alcohol	41.81	5.27
Water	9.64	1.16
Sodium nitrite (15%)	9.04	1.00
UCD 1625E lampblack colorant	1.00	0.10
ACRYSOL™ RM-8W	2.25	0.26
ACRYSOL RM-5000	2.29	0.26
Totals	1037.55	100.00
Levels without Additives:	Volume Solids:	35.4%
	Weight Solids:	48.0%
	PVC:	30.6%
	Density (lb/gal):	10.4
	VOC (g/L):	176
Levels with Additives:	Volume Solids:	36.2%
	Weight Solids:	48.9%

Below Grade Masonry Waterproofer based on KAMICRYL PR SERIES Resin

Material Name	Pounds	Gallons
Grind		
Water	166.67	19.97
Ethylene glycol	10.00	1.07
Natrosol 250 MHR	2.00	0.18
TAMOL™ 681 Dispersant	12.00	1.32
Foamaster 111 defoamer	1.00	
TRITON™ CF-10 Surfactant	2.00	0.23
Ti-Pure R-931 titanium dioxide	50.00	1.65
Minex 4 extender	150.00	6.89
Mistron 353 talc	50.00	2.15
Sand	175.00	7.91
Grind Subtotal	618.67	
Letdown		
KAMICRYL PR SERIES	450.00	51.14
Optifilm 400 Film Enhancer	6.07	0.75
<i>Add grind from above with good agitation</i>		
Texanol ester alcohol	24.30	3.06
Foamaster 111 defoamer	2.00	
Ammonia (28%)	1.10	0.15
ACRYSOL™ RM-5000 Rheology Modifier	12.00	1.38
Water	14.66	1.76
Totals	1128.80	
Levels without Additives:	Volume Solids:	40.1%
	Weight Solids:	55.6%
	PVC:	46.4%
	Density (lb/gal):	11.3
	VOC (g/L):	96
Levels with Additives:	Volume Solids:	42.2%
	Weight Solids:	57.3%

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