



The Chemical Company

Acronal[®] PLUS 4235

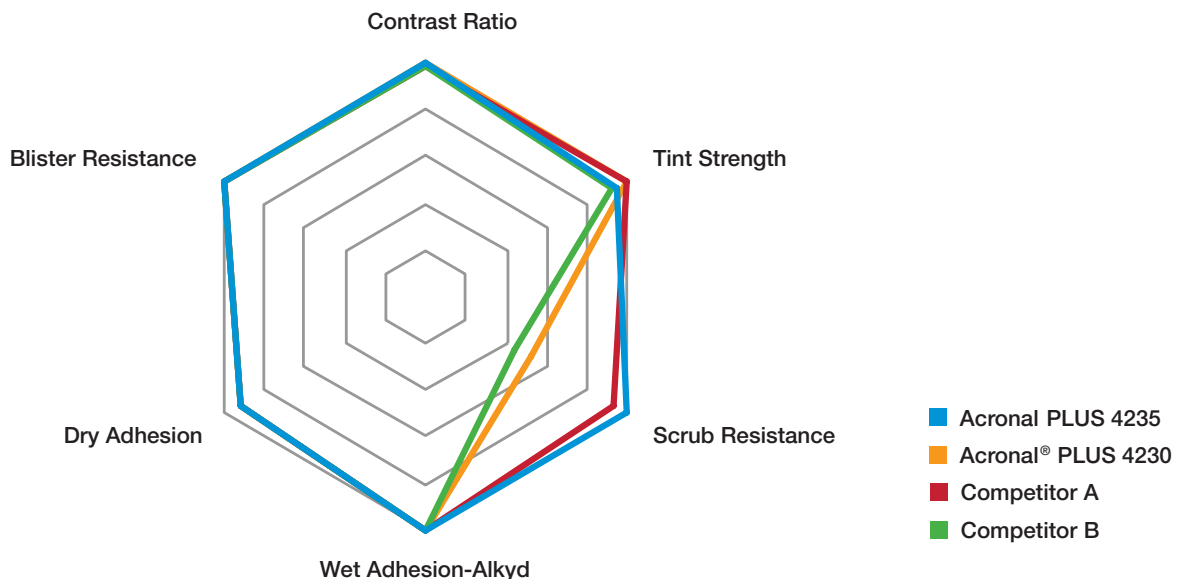
Meeting stringent environmental standards while delivering outstanding weathering performance

Acronal® PLUS 4235

Meeting stringent environmental standards while delivering outstanding weathering performance.

Acronal PLUS 4235 was designed with current and pending VOC regulations in mind. This high solids, all-acrylic latex can be widely formulated in interior and exterior flat through satin paints. Acronal PLUS 4235 meets environmental standards while delivering outstanding weathering performance. Features of this resin include high scrub-resistance, excellent wet adhesion to aged alkyd, and improved surfactant leaching resistance and dirt pick-up resistance compared to competitive acrylics. Acronal PLUS 4235 can be formulated with or without zinc oxide at 50 VOC and lower.

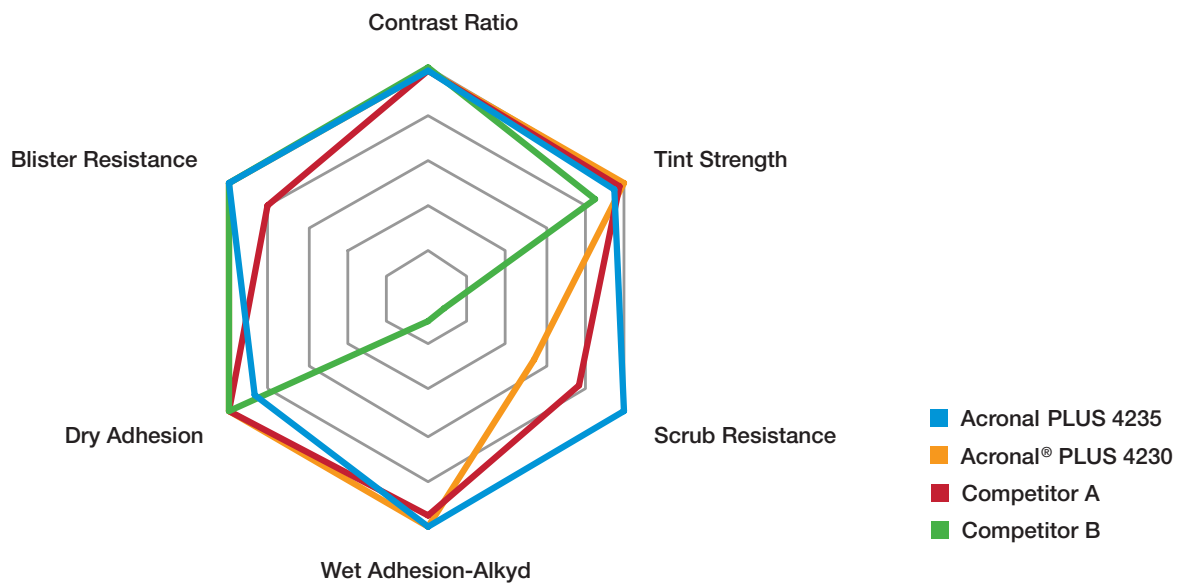
Performance of Acronal PLUS 4235 in an exterior flat formulation



	Acronal PLUS 4235	Acronal PLUS 4230	Competitor A	Competitor B
Contrast Ratio	97.22	97.43	96.61	95.68
Tint Strength	94.11	100	100.22	91.76
Scrub Resistance	833	460	770	368
Wet Adhesion-Alkyd (% removed at 2,000 cycles)	0	0	0	0
Dry Adhesion	4 – 5	4 – 5	4 – 5	4 – 5
Blister resistance	10	10	10	10

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Performance of Acronal PLUS 4235 in an exterior flat formulation with zinc oxide



	Acronal PLUS 4235	Acronal PLUS 4230	Competitor A	Competitor B
Contrast Ratio	96.75	96.97	96.92	98.15
Tint Strength	94.83	100	97.54	84.9
Scrub Resistance	788	259	603	66
Wet Adhesion-Alkyd (% removed at 2,000 cycles)	0	0	40	100
Dry Adhesion	4 - 5	5	5	5
Blister resistance	10	10	8	10

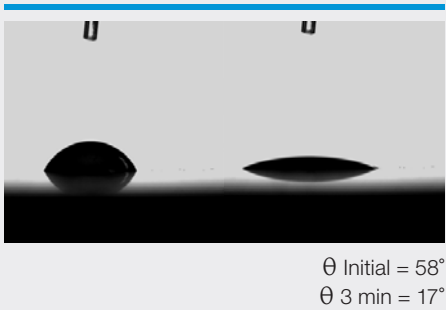
Acronal[®] PLUS 4235

Dirt pick-up resistance and surfactant leaching

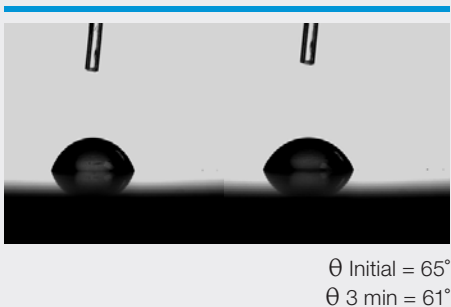
The design of Acronal PLUS 4235 provides formulation capabilities for great dirt pick-up resistance and surfactant leaching resistance, both important considerations for exterior formulations. Comparing the contact angle of Acronal PLUS 4235 with that of a commercial resin designed for exterior performance, it becomes clear that Acronal PLUS 4235 is more hydrophobic, which translates to early improved surfactant leaching properties as well as less dirt pick-up over time.

Contact angle at 2 hour dry time of red iron oxide paint

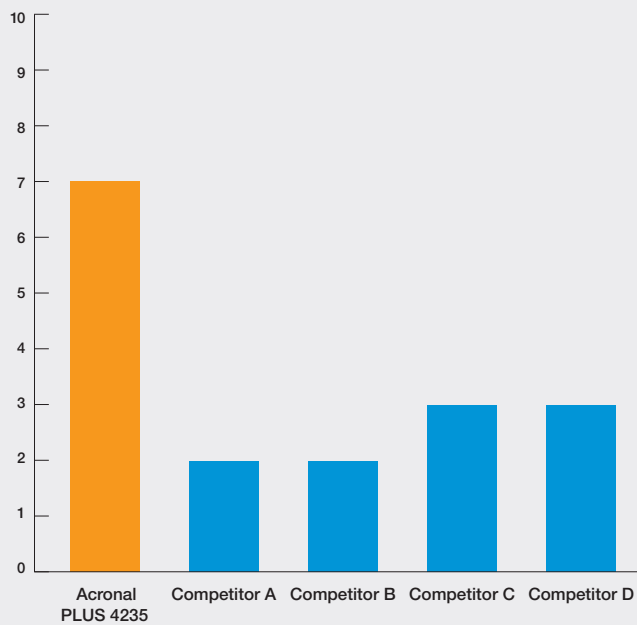
Traditional Latex



Acronal PLUS 4235

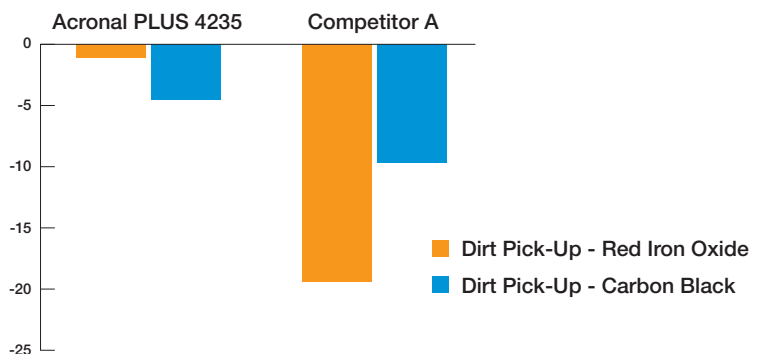


Early Surfactant Leaching Resistance (2 hr cure)



The unique design of Acronal PLUS 4235 aids in preventing dirt pick-up. The graph to the right shows a leading competitor compared to Acronal PLUS 4235 in the same formulation. The Acronal PLUS 4235-containing paint has drastic improvement in dirt pick-up resistance for both red iron oxide staining media as well as dry carbon black powder.

Change in Reflectance (Y value) with Dirt Pick-Up



Acronal® PLUS 4235

Formulation Guidelines

Acronal PLUS 4235 is an all-acrylic high solids resin delivering superior performance at low VOC for flat through satin sheens. This latex can be formulated at 50 g/L VOC to give excellent film properties and excellent freeze/thaw stability. When used with hydrophobic surfactants, Acronal PLUS 4235's properties improve dirt resistance through lower surface wetting. Acronal PLUS 4235 has also been shown to reduce the titanium load up to 10% depending on optimization of the control formulation.

Latex Properties

Acronal PLUS 4235 Acrylic Latex Resin

Solids Content, Weight %	54.0 – 56.0
pH	8.0 – 9.0
Brookfield Viscosity, cps	<1200
Specific Gravity, g/cm ³	ca. 1.07
Density, lbs/gal	ca. 8.9
MFFT, °C	ca. 6
Particle size, nm	ca. 270

Dispersants

The Dispex® line of dispersants are recommended for this product. Hydrophobic dispersants Dispex® CX 4320 and Dispex® CX 4325 have proven effective, with a good balance of tint strength and performance properties. Tamol™ 165 has also been used effectively.

Defoamers

The FoamStar® line of defoamers can be used for Acronal PLUS 4235. Specifically, FoamStar® ST 2420 is a well-rounded option for formulating with this dispersion.

Rheology Modifiers

HEUR, HMPE, HASE, and cellulosic rheology modifiers are all compatible with Acronal PLUS 4235. Rheovis® rheology modifiers have resulted in great performance properties at low VOC. Use of Rheovis® PE 1331 allows for the formulator to meet required high-shear targets at flat through satin sheens while maintaining balanced low-shear contributions. KU range low-shear targets can be met with the addition of Rheovis® PU 1191. Formulations have shown stable viscosities over time using the combination of these two rheology modifiers.

Coalescence

It is recommended for full coalescence, that 5% by weight on polymer solids be used of either evaporative coalescents, such as Texanol™, or 0 VOC coalescents from the Loxanol® line.

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Suggested Formulations

Exterior Flat House Paint Formulation

raw materials	lbs	gallons
Water	150.0	18.01
Natrosol™ Plus 330	3.0	0.28
Ammonium Hydroxide	1.0	0.12
Dispex® CX 4320	10.0	0.97
FoamStar® ST 2420	2.0	0.29
Proxel™ GXL	2.0	0.21
Ethylene Glycol	9.0	0.97
Minex® 4	225.0	10.34
Attagel® 50	2.0	0.10

Grind for 15 – 20 minutes, then add:

Water	69.7	8.37
Ti-Pure® R 746	300.0	15.45
Texanol™	8.0	1.01
FoamStar® ST 2420	2.0	0.29
Efka® FA 4620	2.0	0.19
Acronal PLUS 4235	360.0	40.69
Polyphase® 678	6.0	0.62
Rheovis® PE 1331	5.0	0.58
Rheovis® PU 1191	13.0	1.51

Total	1169.7	100.00
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Viscosity (KU)	95 – 105
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Viscosity (ICI)	1.0 – 1.5
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Weight Solids %	57.8
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Volume Solids %	40.5
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PVC %	43.9
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VOC g/L	50
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Exterior Flat Paint with Zinc Oxide Formulation for MPI #10

raw materials	lbs	gallons
Water	150.0	18.01
Proxel™ BD 20	3.0	0.33
Ethylene Glycol	7.0	0.76
Natrosol™ Plus 330	2.0	0.19
Ammonium Hydroxide	2.0	0.24
Dispex® CX 4325	10.0	1.00
FoamStar® ST 2420	2.0	0.26
Minex® 4	200.0	9.20
Kadox® 915	25.0	0.53
Attagel® 50	2.0	0.10

Grind for 15 – 20 minutes, then add:

Water	61.6	7.39
Ti-Pure® R 746	300.0	15.45
Texanol™	10.0	1.26
FoamStar® ST 2420	2.0	0.29
Acronal PLUS 4235	360.0	40.69
Polyphase® 678	6.0	0.62
Rheovis® PU 1191	6.5	0.76
Rheovis® PE 1331	25.0	2.91

Total	1180.2	100.00
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Viscosity (KU)	90 – 95
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Viscosity (ICI)	1.5 – 2.0
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Weight Solids %	57.3
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Volume Solids %	39.6
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PVC %	43.0
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VOC g/L	49
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Acronal® PLUS 4235

Suggested Formulations (continued)

Exterior Satin House Paint Formulation

raw materials	lbs	gallons
Water	100.0	12.00
Proxel™ GXL	2.0	0.21
Ethylene Glycol	8.0	0.86
Ammonium Hydroxide	1.0	0.12
Dispex® CX 4240	6.0	0.64
FoamStar® ST 2420	2.0	0.29
Natrosol™ 330 Plus	1.0	0.09
Minex® 7	100.0	4.61
Attagel® 50	2.0	0.10

Grind for 15 – 20 minutes, then add:

Water	108.6	13.04
FoamStar® ST 2420	2.0	0.29
Texanol™	8.0	1.01
Ti-Pure® R 746	330.0	16.99
Acronal PLUS 4235	420.0	47.48
Rheovis® PE 1331	20.0	2.33
Rheovis® PU 1191	8.0	0.93
Polyphase® 678	6.0	0.62

Total	1094.6	100.00
Viscosity (KU)	90 – 95	
Viscosity (ICI)	1.5 – 2.0	
Gloss 85°	40 – 45	
Weight Solids %	53.2	
Volume Solids %	38.3	
PVC %	31.0	
VOC g/L	50	

About the Dispersions & Pigments Division

The Dispersions & Pigments Division in North America offers a comprehensive portfolio of resins, binders, latex, pigments and effect pigments, colorants, and systems to meet specific application needs for the coatings, construction, printing and packaging and plastics markets. Our innovative products also help manufacturers in the adhesives, nonwovens and fiber bonding industries meet functional and performance demands. Our formulation additives, rheology modifiers, light stabilizers, photoinitiators, and antioxidants significantly enhances the existing BASF product portfolio for these markets. For more information about BASF's Dispersions & Pigments Division, visit www.basf.us/dpsolutions.

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