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CoatOSil™ DRI Waterborne Silicone

MARKETING BULLETIN

SILICONE - COATING RESIN

CoatOSil DRI waterborne silicone resin can help reduce water uptake and improve UV resistance in organic waterborne coating compositions. Its chemical structure enables CoatOSil DRI waterborne silicone resin to overcome the difficulties of combining silicone materials with organic waterborne resins.

CoatOSil DRI waterborne silicone resin has been shown to improve hydrophobicity and elongation properties when used as a co-binder with acrylic latexes, resulting in more flexible coatings and sealants. CoatOSil DRI waterborne silicone resin can also be considered as a sole binder when maximum thermal and UV stability is a priority. When applied alone, CoatOSil DRI waterborne silicone resin cures at room temperature to form an elastomeric film.

Key Features and Typical Benefits

- Enhanced water, UV, and mar resistance.
- Formation of a more flexible coating as a co-binder with acrylic latex, without detrimental effect to adhesion, re-coatability, and dirt pick up.
- Compatibility with a variety of waterborne polymer systems, including many:
  - Acrylics
  - Epoxies
  - Alkyds
  - Styrene Acrylics
  - PUDs

Potential Applications

- Architectural Coatings
- Wood Coatings
- Concrete Coatings
- Roof Coatings

Typical Physical Properties

CoatOSil DRI waterborne silicone resin is a low viscosity emulsion with the following typical characteristics:

Property	Measure	Value
Appearance	n/a	White, opaque liquid
Actives Content	%wt	~ 45
Density at 25 °C	gm/cm^3	1.1
Viscosity at 25 °C	cps	~ 20
pH	pH	~ 11
Particle Size	nm	~ 120

General Considerations for Use

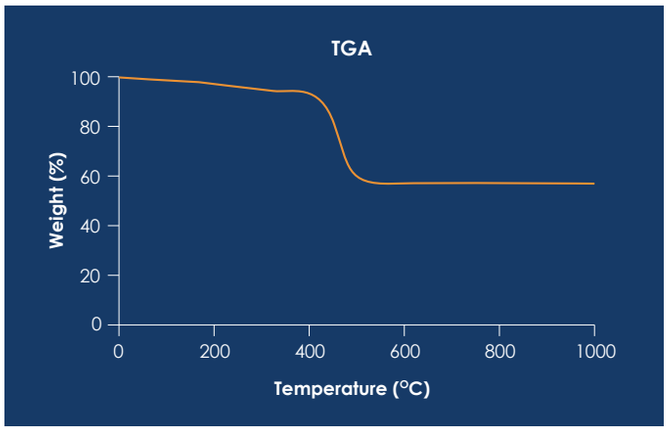
Typical dosages of CoatOSil DRI waterborne silicone resin are between 5% and 30% when used as a co-binder in latex systems to improve water and UV resistance. To aid in evaluating the silicone for use as a sole binder, the typical physical properties of the neat product applied via drawdown and cured at room temperature are shown below:

Property	Measure	Value
Tensile	psi	~ 500
Elongation	%	~ 450
Hardness Shore A	Shore A	~ 30
Elastic Recovery	%	> 90
Tg	°C	- 41

Typical properties are average data and are not to be used as or to develop specifications.

Temperature Resistance Test

The cured films containing CoatOSil DRI waterborne silicone resin also exhibited compositional resistance to high temperatures. TGA data indicated the composition of cured films was stable until around 400 °C.



Note: Test results. Actual results may vary.

Water Vapor Transmission

Based on a customized E96 principle, the "wet" method was used: i.e. water vapor (100% RH) transmits through a sealed cup mouth of CoatOSil DRI film in a 50% RH/23C chamber. Two CoatOSil DRI film samples with different DFT (635µm and 381µm) were tested.

The following 2 sets of data were obtained:

For a 635µm DFT of CoatOSil DRI film sample:
WVTR =106 g/m²/24h

For a 381µm DFT of CoatOSil DRI film sample:
WVTR =123 g/m²/24h

Water Vapor Transmission Rate measured as grams per 24hrs per square meter area with defined thickness.

Note: Test results. Actual results may vary.

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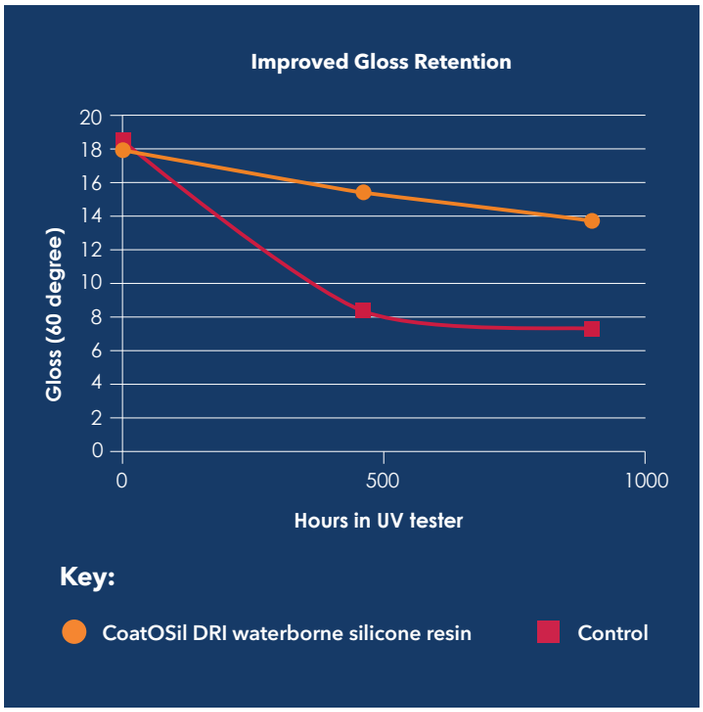
Application Examples

Gloss Retention and Color Stability Test

CoatOSil DRI waterborne silicone resin can be formulated into coatings as a co-binder with the main binder, such as acrylic latex, PUD, epoxy, etc.

In our testing, the addition of CoatOSil DRI waterborne silicone resin in an acrylic latex (within 20~40 wt% based on the weight of the main binder) resulted in significant improvement to gloss retention and color stability.

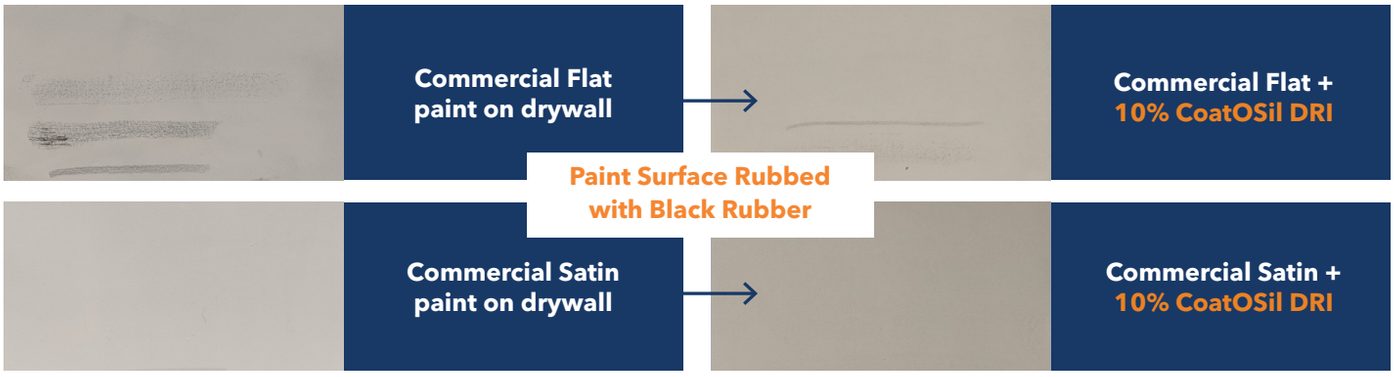
Paint Sample	Color Change (ΔE) After QUV 1000 hrs
Control	1.8
Control +14% CoatOSil DRI waterborne silicone resin	1.5
Improvement %	29



Note: Test results. Actual results may vary.

CoatOSil DRI Waterborne Silicone Resin as a Post-Add Modifier for Architectural Paints

Commercial paint formulations were tested in both flat and satin sheens, with and without the addition of 10% CoatOSil DRI. Drywall was painted and tested by rubbing a black rubber stopper on both samples. Sample with CoatOSil DRI waterborne silicone resin exhibited significantly better scuff resistance than the control sample.



Note: Test results. Actual results may vary.

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Application Examples (continued)

CoatOSil DRI Waterborne Silicone Resin as a Post-Add Modifier for Wood Coatings

As a post-add additive CoatOSil DRI waterborne silicone resin can help improve UV resistance and certain stain/chemical resistance, as well as reduce water absorption and tannin leaching (when exposed to environmental elements) of existing waterborne wood coatings.

After 500 hours of QUVA accelerated weathering, panels utilizing CoatOSil DRI waterborne silicone resin as a post-add additive exhibited better UV resistance over commercial wood stain and sealer.

Note: Test results. Actual results may vary.

Water absorption test on coated wood panels:

After coatings were left to dry for 7 days, panels were weighed. Panels were placed with coated-side down into water. The wood floated on the surface with only the coated sides exposed to water, simulating the effect of standing water on a deck. The panels were left in the water for 24 hours and then removed from the water and gently shaken to remove excess water. Panels were left to dry for 24 hours before reweighing. The weight difference was compared as % weight of water absorbed.

When formulated into the main binder as a co-binder, CoatOSil DRI waterborne silicone resin can help to improve water resistance and flexibility. Additional performance features, such as chemical resistance, can be achieved by incorporating CoatOSil DRI waterborne silicone resin in combination with CoatOSil MP 200 epoxy silane oligomer, which brings an additional crosslinking point to the curing system.

Table 6: Gloss loss and color change measurement of coated wood panels - Comparison After 500 Hours QUVA

Coated Wood Sample	Loss % 60-degree gloss	Color change ΔE
Control	25	33.74
Post-add 10% CoatOSil DRI Resin	4	21.51

CoatOSil DRI Waterborne Silicone Resin as Additive Helps Stop Tannin Leaching in Water

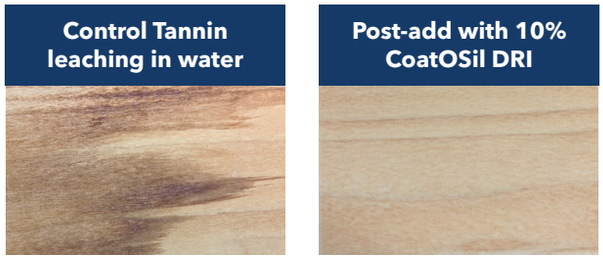

Table 7: Water absorption measurement of coated wood panels - Water Absorption Comparison

Coated Wood Panel	Water adsorbed %
Control	4.3
Post-add 10% CoatOSil DRI Resin	3.0
Improvement %	~ 30

Note: Test results. Actual results may vary.

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Application Examples (continued)

CoatOSil DRI Waterborne Silicone Resin with CoatOSil MP 200 epoxy silane for Wood Coatings

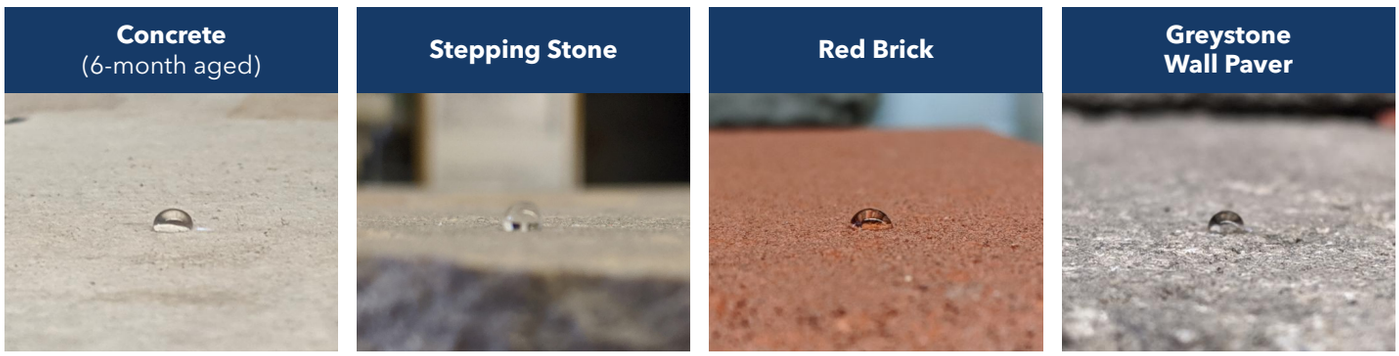
A reformulation of a 29% PVC (Pigment Volume Concentration) white wood coating with the replacement of 10% (dry/dry) of the existing WB acrylic binder with CoatOSil DRI silicone resin and 0.5% of CoatOSil MP 200 epoxy silane can help to improve the wet adhesion on soft wood like pine.

One coat of the same white paint is applied with a brush directly on oak at 100µm wet. After 7 days of drying at room temperature, the panels are put in a climatic chamber for 48h at 40°C, 100% HR. The objective is to accelerate the tannin bleeding contained into the wood, which is seen as a yellowish/brownish aspect in the surface of the coating. The combination of CoatOSil DRI silicone resin and CoatOSil MP 200 epoxy silane can improve the tannin bleeding resistance in one coat.

CoatOSil DRI Waterborne Silicone Resin for Concrete Sealers

As shown in the picture below, 6-month aged concrete, stepping stone, red brick and greystone paver were treated with diluted CoatOSil DRI waterborne silicone resin (10% in water, ~4.5% coating solids) resulting in excellent water beading effects on the surface.

Generation of Water Beading Effect with CoatOSil DRI Waterborne Silicone Resin (10% in Water)



Note: Test results. Actual results may vary.

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Application Examples (continued)

Hot Tire Resistance Testing on Concrete of CoatOSil DRI Waterborne Silicone Resin (10% in Water)

In this study, three different waterborne technologies were used for comparison: commercial 1K waterborne epoxy garage floor coating, a diluted Acrylic latex coating (10% in water, ~5% solids), and diluted CoatOSil DRI waterborne silicone resin (10% in water, 4.5% solids).

Panel Preparation:

1. 3X6 inch concrete panels were washed with soap and water and dried for 24 hours.
2. ~3 grams of each coating were applied onto the concrete plaques respectively using a 1/4 inch nap premium white woven roller.
3. All panels were dried at ambient for 7 days.
4. Panels were then soaked with moist cheesecloth for 1 hour while the tire sections used for testing were also soaked in 140 ˚F water for 1 hour.
5. Next the cheese cloth was removed after 1 hour and the tire sections were clamped tightly to the surfaces of the coated panels. Clamped panels were subjected to 140 ˚F for 1 hour.
6. After 1 hour the tire sections were removed and panels were rated for Imprint, Adhesion, Black Marking (10 = best and 0 = worst).

Concrete panel coated with Commercial 1K WB Epoxy garage floor coating

Adhesion - 10 | Imprint - 2
Black Marking - 4

Concrete panel coated with diluted Acrylic latex (10% in water, 5% solid)

Adhesion - 10 | Imprint - 2
Black Marking - 2

Concrete panel coated with diluted CostOSil DRI (10% in water, 4.5% solid)

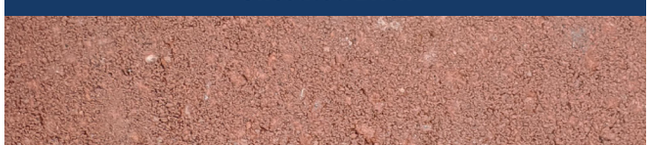
Adhesion - 10 | Imprint - 2
Black Marking - 10

CoatOSil DRI waterborne silicone resin (10% in water) as a sealer showed excellent resistance to black marking while maintaining good adhesion.

Enhanced Color on Red Brick Using CoatOSil DRI Waterborne Slicone Resin (10% in Water)

Also as shown in the picture below, treatment of red brick with diluted CoatOSil DRI waterborne silicone resin (10% in water) not only enhanced the natural color of the brick, but also eliminated the chalky, gritty feeling on untreated brick and generated a soft feel-to-touch surface.

Uncoated Brick



10% CoatOSil DRI in water

Note: Test results. Actual results may vary.

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Patent Status

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