

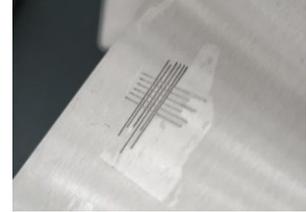


How to Formulate with EXOCOAT™ Ceramic+

Introduction EXOCOAT Ceramic+

EXOCOAT Ceramic+ is a high-performance coating resin used in creating hard, durable and easy to clean finishes or anti-graffiti coatings.

EXOCOAT Ceramic+ can function as stand-alone coating. Usually applied at a dry film thickness of 1 to 3 µm it forms a durable glossy ceramic finish that is hard (8H), easy to clean, very hydrophobic and oleophobic, which is strongly bond to various substrates (CO) and moreover heat resistant up to 600°C.



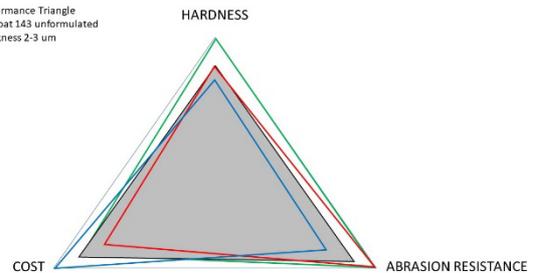
Why formulating with EXOCOAT Ceramic+?

Although EXOCOAT Ceramic+ was designed to be applied as a ready-for-use coating, users with a minimum amount of paint formulation skills may have a need to further fine-tune the product to specific requirements they – or their customers – may have.

In this bulletin, we describe a few formulation strategies focused on:

- Improved application by wiping or polishing
- Improved scratch and abrasion resistance
- Improved touch (glide sensation)
- Reduced cost in application

Performance Triangle
Exocoat 143 unformulated
Thickness 2-3 µm



Dilution of EXOCOAT Ceramic+

EXOCOAT Ceramic+, when applied as such, is a thin, low viscosity liquid, suitable for various application methods. Application by wiping or polishing is possible, but depending on the ambient conditions (temperature, humidity) may show a short drying time.

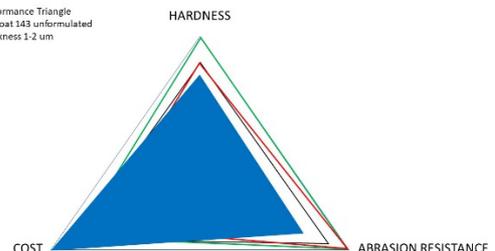
Note: Dilution of EXOCOAT Ceramic+ with butylacetate (to minimum 20% w/w EXOCOAT Ceramic+) improves the workable application time considerably.

Nonetheless, application by wiping or polishing is not recommended in high temperature conditions or with direct sunlight on the substrate.

Reduction of cost in application

The high-performance resin in EXOCOAT Ceramic+ bears a cost. Hence the general interest is using the right coating thickness for the application. Usually, the thickness ranges from 1 to 4 µm. In case wearing is no issue in your particular situation, a DFT of 1 - 2 µm suffices.

Performance Triangle
Exocoat 143 unformulated
Thickness 1-2 µm



Successfully applying thin EXOCOAT Ceramic+ finishes

(1 – 2 µm) is easier after dilution of EXOCOAT Ceramic+ with butyl acetate for example 1:3 in butyl acetate.



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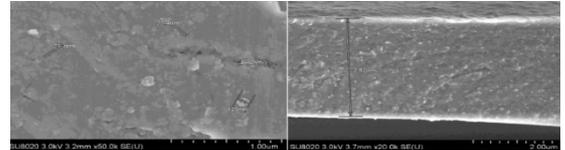
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Thin layers can be applied by wiping with a cloth or by spray application (please contact us to obtain the application instructions: AXC.124.05 Instructions for Use EXOCOAT Ceramic+)

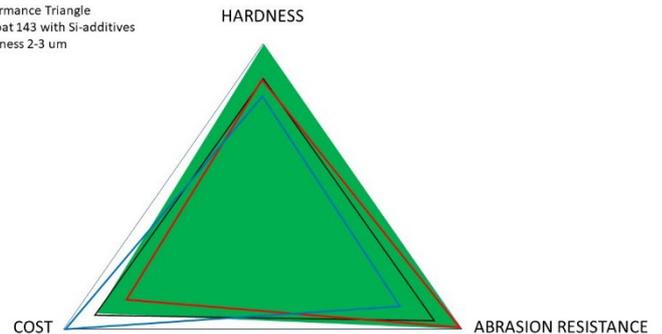
Maximizing scratch and abrasion resistance

EXOCOAT Ceramic+ applied as such, gives excellent scores in scratch (8N) and abrasion resistance. Still, a further improvement can be achieved by incorporating commercially available additives. The following additives have been tested and approved. The addition levels relate to addition to EXOCOAT Ceramic+ (as such).



Product	Supplier	% (w/w)
Aerosil® E9200	Evonik	1%
Aerosil® ¹ E972	Evonik	1%
High MW hydroxy-functional PDMS ²	Generic	1%

Performance Triangle
Exocoat 143 with Si-additives
Thickness 2-3 um

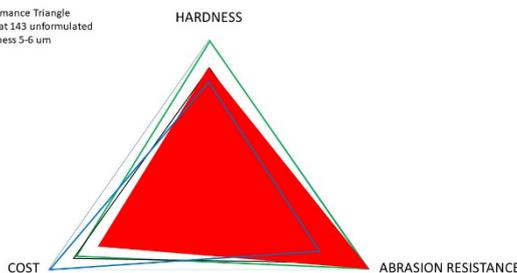


These additives give the coating 9N – 10N scratch resistance (ISO 1518) and allow passing the tough ISO 11998 (200 cycles) wet abrasion test. With Aerosil® additives over 3000 cycles showed no abrasion.

Using dry abrasion, over 100 cycles are possible with these additives.

The incorporation of Aerosil® to EXOCOAT Ceramic+, could change the haptic aspect of the coating to a more metallic feel.

Performance Triangle
Exocoat 143 unformulated
Thickness 5-6 um



Note: Abrasion resistance alone can also be improved by increasing DFT to 5-6 um (> 3000 cycles).

How can you improve soft-touch, haptic or glide sensation of your EXOCOAT Ceramic+ finish?

This subjective aspect of a coating can be dramatically improved by incorporating a high molecular weight hydroxy-PDMS. This was the conclusion of a test program with various additives wherein coated substrates were subjected to a test panel.

A hydroxy-ended PDMS with a calculated Mw of approx. 75000 (2) added at a level of 1% w/w gives superior glide behaviour compared to the reference EXOCOAT Ceramic+ and to some competitive products.

¹ Aerosil® is a registered trademark owned by Evonik

² YASIL OH20000, DOWSIL™ 1-9770 Release Additive or BLUESIL FLD 48V20000



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How to incorporate these additives?



Incorporation of the additives referenced above is done by simple stirring till clear.

For the Aerosil® additives a slight haze may remain; this has no consequences for the coating.

For the inclusion of PDMS special care should be given to the surface aspect, which may – depending on the application – give a slight orange-peel effect. Fine-tuning the formulation will solve this.

Note: Formulating with EXOCOAT Ceramic+ requires the use of a nitrogen or argon blanket to prevent any air entrapment. If the formulation is used within a few hours such precaution is not necessary.



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