



All-round Ceramic Treatment for Car, Yacht and Motorcycle

Protect the lacquer

Ceramic coatings for cars, yachts and motorcycles have become very popular the last decade. They are used as a sealer on top of the existing clearcoat of the vehicle becoming a part of the coating system. Many products claim to be ceramic and assert durable protection, but Axcentive commercially sells coatings that provide long-lasting defense against the elements.

In chemical terms, ceramics refer to crystalline oxides such as titanium, zirconium or silicon oxides. They are solids by definition and cannot be employed as such, as powder, as they would be wiped off immediately. One of the most elegant ways of creating ceramic coatings is by its preparation in situ from precursors and/or preceramics. Precursors hydrolyze and condense to a ceramic particle and after

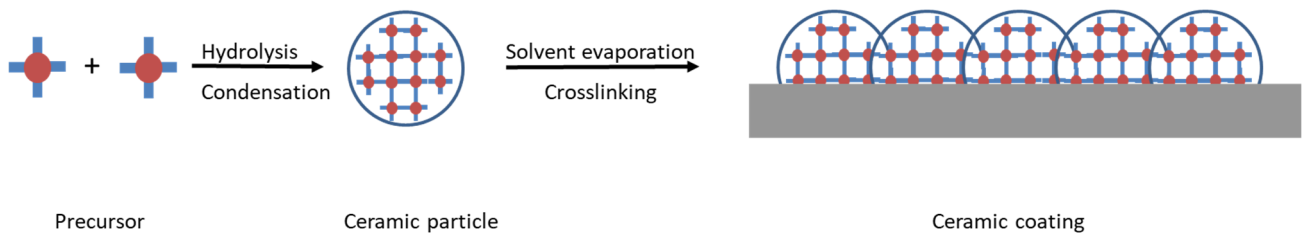


Figure 1.

solvent evaporation a crosslinked network of crystalline oxides forms the ceramic coating. Crosslinking is not limited inside the coating, as chemical bonds are also build with the substrate similar to metals, coated metals and glass which makes the layer truly ceramic and durable (Figure 1).

EXOCOAT 143

EXOCOAT 143 is a ceramic coating that provides all-round protection and visual enhancement of cars, motorcycles and yachts. The coating will provide a depth of color due to its very high gloss, and it delivers a unique easy-to-clean functionality (contact angles to water surpass 100°).

In this report EXOCOAT 143 was subjected to several tests to demonstrate its performance as a ceramic layer.



Sample preparation

A panel was coated by wiping a very thin layer of EXOCOAT 143 onto a system build up from primer, basecoat and clearcoat. EXOCOAT 143 was dried at ambient conditions to form a ceramic topcoat. In this system the dry layer thickness of the ceramic EXOCOAT 143 layer was lower than a 1 micron. (for proper application please read bulletin: AXC.124.04 Instruction for use EXOCOAT 143).



The information presented herein is true and accurate to the best of our knowledge, but without any guarantee unless explicitly given. Since the conditions of use are beyond our control, we disclaim any liability, including for patent infringement, incurred in connection with the use of these products, data or suggestions.

Europe, Americas, Middle East and Africa
Axcentive SARL
Chemin de Champouse
13320 Bouc Bel Air, France
+33 4 42 69 40 90

Asia, India and Australasia
Axcentive Asia Pte Ltd
13 Lorong 8 Toa Payoh,
#07-01 Braddell Tech Park
319261 Singapore
+65 6258 6338



Mechanical Resistance

The mechanical resistance of EXOCOAT 143 was tested as a ceramic topcoat and in below table the test results of several mechanical tests are shown:

	EXOCOAT 143 Ceramic topcoat
High pressure water jet resistance	Pass, no effect on aesthetics and contact angle
Scratch resistance – ISO 1518	16N
Abrasion Resistance - ISO 11998 200 cycles	Pass, no effect on aesthetics and contact angle
Jeans scuffing 200 cycles	Pass, no effect on aesthetics and contact angle
UV radiation-cyclic test 250hrs	Pass, no effect on aesthetics and contact angle

From the table it can be deduced that mechanical action such as spray with high-pressure water jets and mechanical abrasion do not have any effect on the submicron thick EXOCOAT 143 coating. Also, UV radiation does not impact the coating.

Chemical resistance

In the test of chemical resistance several harsh and corrosive chemicals were left on the EXOCOAT 143 coated surface for 24hrs. After 24hrs the panel was rinsed with water and an observation was made of the area of the chemical spot. If no spot could be observed, the chemical resistance is 100%. In the case of EXOCOAT 143 the coating provided a 100% score with 8 out of 8 chemicals, including mustard, wine and acid. The excellent chemical resistance of EXOCOAT 143 is shown in the pictures of below table.

	<p>1 –Wine 2 –Coffee 3 –Orange juice 4 –Mustard 5 –Ketchup 6 –MEK 7 –pH 2 8 –pH 12</p>		
Setup		With chemicals	After rinsing with water

Egg test and Easy to clean test

Eggs are known to stick well to surfaces and hence form a reference to show if a ceramic coating is nonstick in nature. On the EXOCOAT 143, ceramic coating an egg was placed on a horizontal surface and let to dry at 40°C for 24hrs. For comparison, a reference test with the ‘standard’ coating system, buildup from primer, basecoat and clearcoat was tested side by side. In the table below it is shown that the egg does not stick to the surface of EXOCOAT 143 and could be scraped away directly after, drying. On the right side the reference clearcoat with no additional ceramic layer is shown. The egg sticks to this coating and cannot be removed.



The information presented herein is true and accurate to the best of our knowledge, but without any guarantee unless explicitly given. Since the conditions of use are beyond our control, we disclaim any liability, including for patent infringement, incurred in connection with the use of these products, data or suggestions.

Europe, Americas, Middle East and Africa
Axcentive SARL
Chemin de Champouse
13320 Bouc Bel Air, France
+33 4 42 69 40 90

Asia, India and Australasia
Axcentive Asia Pte Ltd
13 Lorong 8 Toa Payoh,
#07-01 Braddell Tech Park
319261 Singapore
+65 6258 6338



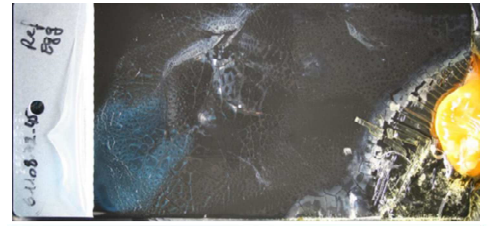
Egg left at 40°C for 24hrs

Permanent marker test scribed then above side wiped with cloth

EXOCOAT 143



Reference



An test for determining the easy to clean properties of a coating is the permanent marker test (EN NF31-112 similar to ASTM D6578). With a permanent marker a scribe is made onto the coating and after drying the scribe is wiped with a clean cotton cloth. In the case of a treated surface the scribe is completely removed after a wipe by hand as shown in the picture in above table (2nd column named EXOCOAT 143). On the other hand, on the right side of the same row in the table the reference coating system (clearcoat with no E.143) is shown. It could not be cleaned at all, and the scribe could not be removed.

EXOCOAT 143 Formulations

EXOCOAT 143 is supplied as 60% solution in n-butyl acetate and can be used as such. If desired EXOCOAT 143 may be formulated with additives, co-resins and diluents. Dependent on the application acrylic resins, siloxane resins, amino silicones and wetting agents can be added. It is important however to avoid the use of water or any protic solvents. Guide formulations can be given upon request.

EXOCOAT CLEARVIEW

EXOCOAT Clearview is a ready to use, ceramic, sol-gel-based system for use on any type of glass. EXOCOAT Clearview can be easily applied by buffing it with a microfiber cloth. (please refer to bulletin: AXC.130.01 - Instructions for use EXOCOAT CV). After application, an invisible, transparent but extremely hydrophobic layer is achieved.

Increase driver visibility and safety

One of the main frustrations when driving in rainy conditions is limited or hindered sight when water films on the windshield due to heavy rain and/or the use of worn wipers. While glass is very hydrophilic in nature (attracts water) rainwater sheds unrestrained, hindering sight (photo right).

A solution to this problem is to change the nature of the glass on the windshield. EXOCOAT Clearview converts the windshield to a hydrophobic and oleophobic surface from which water droplets run down quickly or roll off to the sides (photo below).



The information presented herein is true and accurate to the best of our knowledge, but without any guarantee unless explicitly given. Since the conditions of use are beyond our control, we disclaim any liability, including for patent infringement, incurred in connection with the use of these products, data or suggestions.

Europe, Americas, Middle East and Africa
Axcentive SARL
Chemin de Champouse
13320 Bouc Bel Air, France
+33 4 42 69 40 90

Asia, India and Australasia
Axcentive Asia Pte Ltd
13 Lorong 8 Toa Payoh,
#07-01 Braddell Tech Park
319261 Singapore
+65 6258 6338



In an extensive evaluation, glass treated with EXOCOAT Clearview was subjected to several performance tests, which are summarized in the table below.

From the results in the table it is shown that the treatment, has no effect on the aesthetics of the glass, and has become hydrophobic and oleophobic with a very high hardness and superb scratch resistance.

Test	Result glass coated EXOCOAT Clearview
Transparency vs Glass	99.99%
Haze 400-700nm (avg)	0.25%
Aesthetics	No effect, no glaring, no impact on the antireflective (AR) coating
Adhesion (ISO2409)	0 (100% adhesion)
Hardness	9H
Scratch Resistance	20N
Water Contact Angle	103° (43° for neat glass)
Hexadecane contact angle (HCA)	62° (0° for neat glass)

An important feature of hydrophobic coatings is their durability against scrub and wiper movements. Practical tests with cars moving around in northern Europe with on average 100 rain days a year has shown the durability EXOCOAT Clearview treated windshields whilst still using the wipers, is about 9 to 12 months. With a renewal of the application, following Axcentive’s instructions for use, the EXOCOAT coating can be revitalized in less than 5 minutes.

In this report EXOCOAT 143 and EXOCOAT Clearview were presented. The technology of these ceramic coatings from liquid precursors and preceramics form the current state of art in the industry. EXOCOAT 143 and EXOCOAT Clearview, true ceramic systems are proven thin layer protective coatings for paint work and glass on cars, motorcycles, and yachts. EXOCOAT 143 is meant to protect the paint work with easy-to-clean properties whereas EXOCOAT Clearview provides a rain shield for windshields. Being ceramic in nature, longevity of the treatment is assured.



The information presented herein is true and accurate to the best of our knowledge, but without any guarantee unless explicitly given. Since the conditions of use are beyond our control, we disclaim any liability, including for patent infringement, incurred in connection with the use of these products, data or suggestions.

Europe, Americas, Middle East and Africa
Axcentive SARL
Chemin de Champouse
13320 Bouc Bel Air, France
+33 4 42 69 40 90

Asia, India and Australasia
Axcentive Asia Pte Ltd
13 Lorong 8 Toa Payoh,
#07-01 Braddell Tech Park
319261 Singapore
+65 6258 6338