



# Technical Leaflet

## Non-stick resins for Easy to Clean and Anti-Graffiti Coatings

AXC.113.03

### Introduction

Axcentive has recently developed new non-stick resins for easy to clean (E2C) and anti-graffiti coatings. Coating based on these new resins show strong graffiti repellence. Water and solvent based graffiti paints will not wet sufficiently and can be wiped away easily even after drying of the graffiti. Moreover, soil, dirt, fungus, foul and algae have poor adhesion to these coatings.

To achieve the non-stick performance, the challenge consists in developing resins that adhere strongly to the substrate and create at the same time a very low surface energy.

Low surface energy is reversely correlated to contact angles to water and hexadecane. The lower the surface energy the higher the water and hexadecane contact angles. While high water contact angles make a surface hydrophobic, a high oil contact angle makes it oleophobic. In fact, for easy to clean and anti-graffiti performance one needs a coating that is both hydrophobic and oleophobic as soil, dust and graffiti paint generally contains water and oil-based components that will be repelled by such coating.

International standards have not presently set standard practise for the determination of graffiti resistance or what precisely is easy to clean. With that in the back of our minds we sought for industry standards in close cooperation with development partners and identified 2 reliable ways to check the non-stick properties of a coating.

A practical way to check for the non-stick properties of a coating is to carry out a scribing with a permanent marker and wipe it off after drying. Typically, to noncoated or substrates coated with traditional coatings a marker pen sticks and cannot be wiped off, whereas the ink beads up on the coating with non-stick resin included.

### Permanent marker test

|                       |                                 |
|-----------------------|---------------------------------|
| Product/Resin chosen: | EXOCOAT 143                     |
| Formulation:          | dilution 10% in n-butyl acetate |
| Wet film thickness:   | 20mu                            |

In the permanent marker test a half-coated panel is scribed with a permanent marker. A strong adhesive, solvent-based marker is Edding type 2000 or 8400. Once scribed, the marker is left to dry for 15 minutes after which the plate is wiped with a cotton cloth. In below table a successful easy to clean coating based on EXOCOAT 143 shows immediate signs of dewetting of the marker (picture 2, table below). Secondly when wiping the ink comes off easy and is wiped away in maximum 3 wiping cycles (pictures 3 and 4) by gently rubbing.



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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



|                               | 1   | 2   | 3  | 4   |
|-------------------------------|---|---|--|---|
| Above EXOCOAT 143 coated side |  |  |  |  |
| Below uncoated                |   |   |  |   |
|                               | Scribing on the plate<br>Uncoated part  | Scribing on the plate<br>Coated part  | Wiping the plate   | After wiping  |

The fact the permanent marker does not stick to the EXOCOAT 143 based coating and is easily wiped off indicates the paint has likely good anti-graffiti properties towards solvent and water-based graffiti.

**Mud soil test**

A practical test resembling resistance to soiling with real dirt is the mud soil test. In this test 2 metal plates of which one coated and the other uncoated are drenched into a mud bath consisting of garden soil.

|                       |  |
|-----------------------|--|
| Product/Resin chosen: | EXOCOAT AG-2   |
| Formulation:          | Curing 25:10 with APTES<br>Dilution 30% in isopropyl alcohol |
| Wet film thickness:   | 20mu   |

This test shown in below picture table shows that the plate on the right side coated with EXOCOAT AG-2 solution does not let the mud stick to the plate. The plate remains clean after repetitive soiling with mud. Such property is of high interest to coatings for easy to clean rims, body parts of cars, trains and yachts. When used in the topcoat EXOCOAT AG-2 will contribute to prolonged and improved aesthetics of the finish.



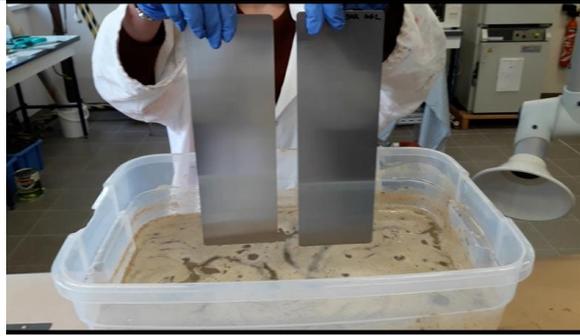
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Europe, Americas, Middle East and Africa  
Axcentive SARL  
Chemin de Champouse  
13320 Bouc Bel Air, France  
+33 4 42 69 40 90

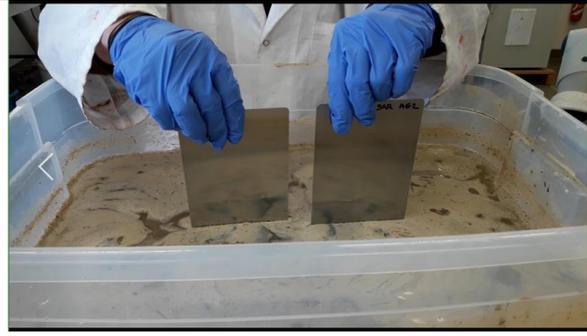
Asia, India and Australasia  
Axcentive Asia Pte Ltd  
13 Lorong 8 Toa Payoh,  
#07-01 Braddell Tech Park  
319261 Singapore  
+65 6258 6338



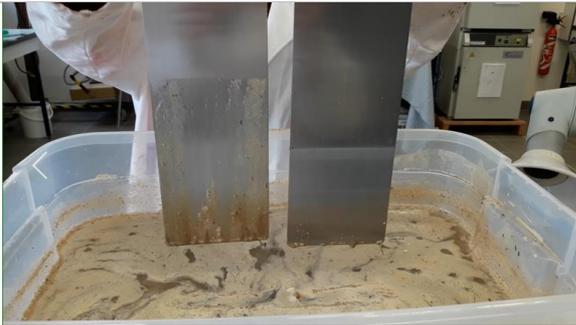
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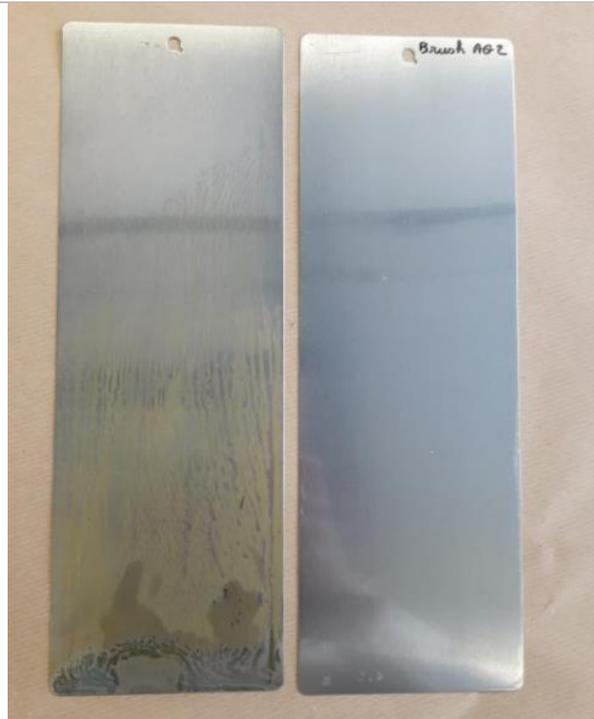
Start: left side not coated, right side coated with EXOCOAT AG-2



Dipping the plates into mud (4x)



4 times up and down in the muddy water  
Left side not coated, right side coated  
(EXOCOAT AG-2)



Result after 4 times soiling in mud. Right side coated with EXOCOAT AG-2

**Durability**

A major factor of success of any coating is the factor durability. A formulator prefers to choose his resins such that its envisioned function (for ex. easy to clean) is combined with optimal durability against mechanical and outdoor abrasion.

Both featured easy to clean resins in this leaflet, EXOCOAT 143 and AG-2 may be formulated into durable strong coatings while being relatively thin (10 up to 20mu), which includes passing test for QUV, salt spray and scratch resistance. Please refer to data in below table.

EXOCOAT 143 is a 1K room temperature system that adheres strongly to many substrates (metal, aluminium, glass, plastics) and once dried may develop a hardness up to 6H. It creates very smooth and glossy films which are non-stick in nature for example used in protective, construction, industrial and automotive coating applications.



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EXOCOAT AG-2 is a 2K system with similar non-stick properties with a short curing cycle of about 3hrs. With layer thickness up to 20µm it may be applied on veneer wood and concrete to obtain easy to clean and anti-graffiti coatings.

Whereas EXOCOAT 143 would be targeted for larger outdoor (easy to clean) applications, where 1K is preferred, EXOCOAT AG-2 would be aimed at industrial or automotive coatings aimed to be used indoors with more control over mixing the 2 components and subsequent curing.

*Key features EXOCOAT 143, EXOCOAT AG-2*

|  | EXOCOAT 143  | EXOCOAT AG-2                                 |
|--|--|--|
| <b>Curing mechanism</b>                                | 1K, moist cure, RT                                   | 2K, APTES 25:10, RT                          |
| <b>Form</b>  | 60% in n-butyl acetate                               | 50% in IPA                                   |
| <b>Dry to touch</b>                                    | 1hr  | 1hr  |
| <b>Dry to handle</b>                                   | 8hr  | 4hr  |
| <b>Full cure (full performance)</b>                    | 1 week   | 1 day  |
| <b>Recommended dilution</b>                            | 10-20% in n-butyl acetate                            | 20% in IPA                                   |
| <b>Application</b>                                     | Brush<br>Spray<br>Cloth wiping                       | Brush<br>Spray                               |
| <b>DFT</b>   | 1-5µm  | 5-15µm                                       |
| <b>Cross hatch adhesion: Pass (ISO2409) Substrates</b> | Metal<br>Aluminum<br>Glass<br>PC<br>PMMA<br>ABS      | Metal<br>Aluminum<br>Concrete<br>Primed wood |
| <b>Max hardness</b>                                    | 6H   | 5H   |
| <b>CA (water)</b>                                      | 105  | 110  |
| <b>CA (HD)</b>   | 57   | 50   |
| <b>Heat resistance</b>                                 | 300°C (till discoloration)<br>600°C (film integrity) | 180°C (discoloration)                        |
| <b>QUV direct to aluminium</b>                         | >1000hrs   | >1000hrs                                     |
| <b>Salt spray direct to bare aluminium 3003</b>        | >1000hrs   | N/A  |

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