



CSIRO

**TEST
REPORT**
XC3166

**Testing
of
Clear Automotive Coating**

CSIRO Materials Science and Engineering

37 Graham Rd (PO Box 56) Highett VIC 3190 Australia
QF-MST.004 revision 5 18/09/2006

tel +61 3 9252 6000 fax +61 3 9252 6011

<http://www.cmmt.csiro.au/>
<http://www.csiro.au>

This Report is subject to binding obligations under which it was prepared. In particular, the Report must not be used:

- as a means of endorsement; or
- in a company prospectus or notification to a Stock Exchange document for capital raising, without the prior written consent of CSIRO.

The Report may be published verbatim and in full, provided that a statement is included on the publication that it is a copy of the Report issued by CSIRO.

Excerpts of the Report may not be published without the prior written consent of CSIRO

Client: Zen Automotive Suppliers Pty Ltd

ABN:

Contact: Joel Blake
Managing Director

Address: Unit 11/12 Stanton Road
Seven Hills
NSW, 2147

Tel: +61 2 1300 599 616

Fax: +61 2 8079 6603

Email: joel@zas.com.au

Report Author: Gerry Eccleston M App Sc.

Tel: 03 9252 6362

Fax: 03 9252 6011

Email: Gerald.Eccleston@csiro.au

Date of Report: 7 February 2013

1.0 INTRODUCTION

At the request of Joel Blake, Zen Automotive Supplier, clear coated card were tested for Scratch and Chemical Resistance.

The sample supplied consisted of 195x290 mm cards coated with Opticoat Batch D6071812A applied on 18/07/2012 by Zen Automotive Suppliers.

In addition six steel panels of 100x300 mm were supplied for UV resistance testing and consisted of:

Sample ID	Details
XC3166/1	White coloured panel untreated
XC3166/2	White coloured panel with Opticoat applied 11/7/12
XC3166/3	Metallic Grey coloured panel untreated
XC3166/4	Metallic Grey coloured panel with Opticoat applied 11/7/12
XC3166/5	Black coloured panel untreated
XC3166/6	Black coloured panel with Opticoat applied 11/7/12

2.0 TEST METHODS

2.1 Scratch Resistance

The scratch resistance was determined in accordance with AS 1580 Method 403.1 'Scratch resistance'. A tungsten carbide needle is slid over the surface. The load required for the needle to penetrate through to the substrate is used to indicate the scratch resistance. A maximum of 2000 gm load is used.

2.2 Test Conditions and Timing

Ambient conditions at the time of the test/s were $23 \pm 3^{\circ}\text{C}$ and $45 \pm 15\%$ RH thereby complying with AS/NZS 1580.101.5

The testing was undertaken on the 30 October 2012 and the results pertain to the samples as received.

2.3 Chemical Resistance

The chemical resistance of the coating was determined in accordance with ASTM D1308-02 'Effect of Household Chemicals on Clear and Pigmented Organic Finishes'

Concentrated Hydrochloric acid, Phosphoric acid, and Ethanol were applied to the surface of the coating, covered and allowed to be in contact with the surface for one hour. The surface was then washed with distilled water, allowed to dry and then inspected.

2.4 UV Light Exposure

The samples were exposed in a QUV accelerated weathering apparatus complying with ASTM D 5208 'Standard Practice for Fluorescent Ultraviolet (UV) Exposure of Photodegradable Plastics'. The test chamber consists of 8 fluorescent UV-lamps, a heated water pan, test specimen rack and provision for controlling and indicating operation times and temperatures. The lamps were UV-A lamps and a spectral distribution as specified in ASTM G154.

The samples were exposed for 1000 hours at the following cycle:

1. UV radiation for 8 hours at 60°C followed by
2. Condensation without radiation for 4 hours at 50°C

The samples were inspected after daily during the working week.

2.5 Colour Change ΔE

Colour Measurement of the panels before and after exposure was carried out in accordance with AS 1580 Method 601.1.

All colour measurements were made with a Minolta Chroma Meter CR-200 tristimulus analyser using diffuse illumination and 0° viewing angle. Measurements are expressed in terms of CIE 1976 tristimulus reflectance coordinates L^* (-black, +white), a^* (-green, +red) and b^* (-blue, +yellow). Colour difference measurements ΔE^*_{ab} was calculated from these values.

$$\Delta E^*_{ab} = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$$

The L^* value records any brightening or lightening in the colour of the panels, whilst the a^* & b^* measures any shift in the colour. The ΔE^*_{ab} records any difference in the colour.

2.6 Gloss Change

The change in gloss was determined in accordance with AS 1580 Method 602.2 using a Sheen Tri-Gloss meter.

3.0 RESULTS

The results are detailed below.

Table 1: Scratch and Chemical Resistance Results

Client Sample No	XC3166
Sample Details	Opticoat Batch D6071812A applied on 18/07/2012
Scratch Resistance <i>AS 1580 Method 403.1</i>	1100 g
Chemical Resistance <i>ASTM D1308-02</i>	Conc. Hydrochloric Acid: No effect Conc. Phosphoric Acid: No effect Ethanol: No effect

Table 2: Gloss Change after UV Exposure

Sample	Gloss 60 head				
	Initial	250 hours	500 hours	750 hours	1000 hours
White untreated	95	95	95	95	94
White Opticoat Treated	92	92	93	93	90
Metallic Grey Untreated	95	98	96	94	91
Metallic Grey Opticoat Treated	96	96	95	93	90
Black Untreated	92	92	93	91	91
Black Opticoat Treated	92	90	91	91	88


Table 3: Colour Change after UV Exposure

Sample	$\Delta E^* ab$				
	Initial	250 hours	500 hours	750 hours	1000 hours
White untreated		2.1	1.8	0.2	0.2
White Opticoat Treated		1.6	1.3	0.4	0.3
Metallic Grey Untreated		0.3	0.4	0.2	0.3
Metallic Grey Opticoat Treated		0.8	0.5	0.2	0.2
Black Untreated		0.4	0.4	0.2	0.4
Black Opticoat Treated		0.5	0.4	0.2	0.4

4.0 CONCLUSION

The testing indicates:

1. Opticoat has an impact resistance of 1100 g and a resistance to concentrated Hydrochloric acid, Phosphoric acid and Ethanol.
2. Opticoat applied to the supplied automotive painted panels does not adversely affect the gloss and colour after 1000 hours UV exposure.



Senior Materials Scientist
6 February 2013