

Evaluation report of SENSHA Glass Coating Crystal Glow series



神奈川県産業技術センター

Kanagawa Industrial Technology Center

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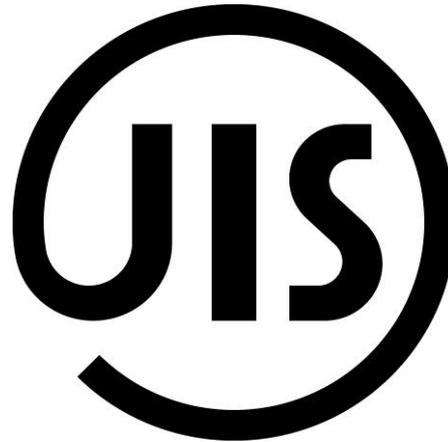
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All the tests were conducted in accordance with the specifications of Japanese Industrial Standards (JIS)



Water Repellency

The accelerated weathering test (JIS K 7350-2-1995) examines the degradation of materials exposed on a field where ultraviolet radiation, temperature, and moisture are affecting on. Each 300 hours, droplets of pure water (ion exchanged water) were dropped on glass coating and a contact angle of a droplet was measured after 10 seconds (Figure 1). This measurement was done for 10 droplets (Figure 2) and an average of the 10 measurements was used as a result. The test condition was as per Figure 3 and water repellency was measured by this test.

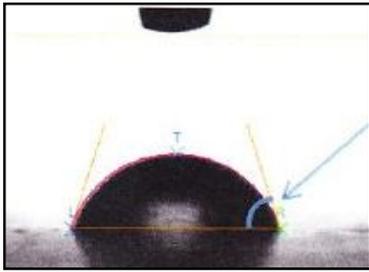


Figure 1. Measuring water contact angle (degree)

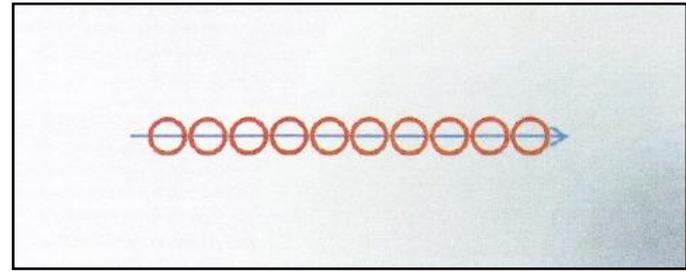


Figure 2. Measuring positions (10 positions)

Measuring method	JIS K 7350-2-1995 and measuring water contact angle (degree)
Light source	Xenon arc light source specified by JIS K 7350-2-1995 Discharge power: 4.5kW ($\pm 2\%$); Irradiation illuminance: 390W/m ² (300~700nm)
Temperature condition	Black panel temperature: 63 \pm 2°C; Temperature in device: 42 \pm 3°C
Spray condition	12 minutes per hour with ion exchanged water (water quality: less than 2 μ S/cm) Spray water amount: 3150 \pm 150 [ml/min]; Spray pressure: 0.8~1.2 [kgf/cm ²]
Number of drum revolution	1 rpm

Figure 3. Measurement condition

Water Repellency (cont'd)

The test result is shown in Figure 4 and 5.

Water contact angle upper than 90 ° means the property of glass coating is water repellency.

Water contact angle less than 90 ° means the property of glass coating is hydrophilicity.

Coating name	Water contact angle (degree)					
	0h	300h	600h	900h	1200h	1500h
Crystal Glow 1-Year Coating	88.8	77.5	77.3	73.7	75.1	73.4
Crystal Glow 3-Year Coating	91.9	92.8	93.3	89.1	92.6	83.5
Crystal Glow 5-Year Coating	96.0	95.1	93.7	95.5	92.8	94.2
Crystal Glow 8-Year Coating	104.8	102.3	103.1	101.0	101.2	98.0

Figure 4. Measuring results of water contact angle

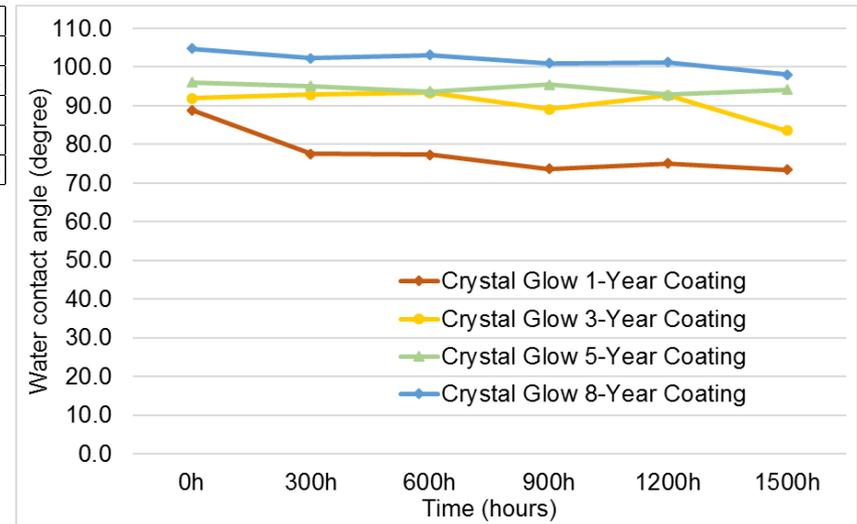


Figure 5. Transition chart of water contact angle

Hence,

Crystal Glow 1-Year Coating is hydrophilicity.

Crystal Glow 3-Year Coating is water repellency.

Crystal Glow 5-Year Coating is water repellency.

Crystal Glow 8-Year Coating is water repellency.

Sustainability period of water contact angle depends upon the service life of each Crystal Glow.

The test method was cross-cut and tape test (JIS K 5600-5-6). Glass coating adhesion was tested by stripping off a pressure sensitive tape firmly attached on the surface of glass coating after cross-cutting it at 1mm intervals. The judgement was done based upon the below table specified by JIS (Figure 6).

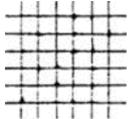
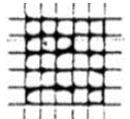
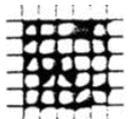
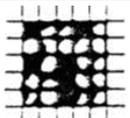
Classification	Apperance	Surface Status
0	<ul style="list-style-type: none"> Not detected any damages on the surface and at edges and cross points are perfectly smooth 	-
1	<ul style="list-style-type: none"> Slight peel-off is detected at cross points of cutting Peel-off affected with cutting is less than 5% 	
2	<ul style="list-style-type: none"> Peel-off is detected along straight line Peel-off affected with cutting is about 5~15% 	
3	<ul style="list-style-type: none"> Peel-off is considerably detected along straight line Peel-off affected with cutting is about 15~35% 	
4	<ul style="list-style-type: none"> Peel-off is considerably detected along straight line Peel-off affected with cutting is about 35~65% 	
5	<ul style="list-style-type: none"> More severe than classification 4 	-

Figure 6. JIS cross-cut result classification

Figure 7 demonstrates the test result of cross-cut and tape test before and after the accelerated weathering test.

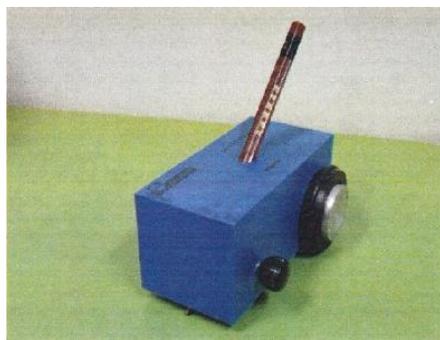
Coating name	Before accelerated weathering test	After accelerated weathering test 1500 hours
Crystal Glow 1-Year Coating	0 (no damages detected)	0 (no damages detected)
Crystal Glow 3-Year Coating	0 (no damages detected)	0 (no damages detected)
Crystal Glow 5-Year Coating	0 (no damages detected)	0 (no damages detected)
Crystal Glow 8-Year Coating	0 (no damages detected)	0 (no damages detected)

Figure 7. Test results of cross-cut and tape test

Hence, Crystal Glow series have the strong adhesion to the car paint surface to perform their features for a long time.

Hardness

Pencil hardness test (JIS K 5600-5-4) was utilized for hardness testing of glass coating. The test begins with the softest pencil lead. If there is no any signs of damages or scratches after applying, repeat the test with one grade harder pencil lead. The max hardness value of the pencil lead, which leaves no any destruction on the coating, is the hardness value of coating tested. The test condition was as per Figure 8 and the result is shown in Figure 9



Measuring method	JIS K 5600-5-4
Pencil angle	45°
Load	750g
Machine moving distance	more than 7mm
Pencil lead range	Until 9H (normally 6H is the max hardness for JIS K 5600-5-4)

Figure 8. Measuring condition

Coating name	Pencil hardness
Crystal Glow 1-Year Coating	9H
Crystal Glow 3-Year Coating	9H
Crystal Glow 5-Year Coating	9H
Crystal Glow 8-Year Coating	9H

Figure 9. Hardness test result

Hence, Crystal Glow series have the 9H hardness which is above JIS standard to protect a car.



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