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Coating Car Wash Test Report

NIC Industries Research & Development Group

Requested By: Cerakote Trim Division **Date:** 07-23-2019
Prepared For: Nolan Kell- Division Manager
Purpose: To determine change in gloss, sheen and color of a Trim Coat treated substrate before and after 200 wash cycles.
Test Method: Cerakote Modified ISO 20566 2013
Test Duration: The full cured Trim Coat panel was subjected to the equivalent of 200+ car wash cycles per internal Cerakote Modified ISO 205660 2013, for a total continuous wash time of 80 minutes.
Cerakote Coating Specifications:

- A bare plastic trim substrate was masked off with a 1" tape width into two pieces. The coating was applied to each half via a coating saturated wipe, with the wipe packet containing 6ml of Cerakote Trim Coat. The upper and lower sections were both coated with the Trim Coat, leaving an uncoated horizontal segment after the tape was removed.

A. Contents

This document contains information regarding the coating, application method, cure schedule, testing procedures and duration, analytical values before and after testing, compiled results, and a conclusion of previously mentioned results.

B. Scope

Testing will be completed according to the Cerakote modified ISO 205660 2013 test method.

C. Procedure

The untreated plastic trim test piece was cleaned and wiped off with Isopropyl alcohol and allowed to evaporate at ambient conditions. Once the Isopropyl alcohol had evaporated the gloss, sheen, color values (in L, a*, b*), and Fourier Transform Infrared Spectroscopy were measured and recorded. The substrate was then divided into two equivalent sections by a piece of painters tape 1" in width. The separate portions of the testing piece were then coated according to the aforementioned "Cerakote Coating Specifications" section. The coated portions of the substrate were measured in the same method to the uncoated substrate after a full 24hour cure at ambient laboratory conditions and before the beginning of the testing procedure. All measurements were taken in triplicate and averaged together for a single value, aside from the FTIR which is measured with 16 scans and reported as a figure.

The test panel was then placed in the apparatus and tested according to the Cerakote Modified ISO car wash method (See Modified ISO 205660 2013). After a wash time of 80 minutes the panel was then collected from the apparatus, lightly wiped off with a microfiber cloth, and

allowed to dry in ambient conditions for an hour. After the allocated drying time all measurements were taken again and recorded.

D. Results and Discussion

The three groups were measured according to the procedure for sheen, gloss, color and IR spectra.

	Sheen (20°)	Gloss (60°)	L	a*	b*
Uncoated	0.2	2.3	30.34	-0.27	-1.04
Cerakote Trim Coat	2.2	15.3	29.02	-0.12	-0.73

Table 1: Shows the values for Sheen, Gloss, and color according to a calibrated X-rite AcuGloss gloss meter and a X-rite Ci6X spectrophotometer before beginning the ISO modified testing procedure

The uncoated portion of the test piece was lighter than both the coated portions with a difference in the L value of greater than 1.2, which is visually detectable as well. Since the coating is clear and does not use pigments, this increase in darkness is solely attributed to the proper wetting of the substrate which remains in the fully cured coating. The difference is more strongly supported by the vast numerical increase in gloss. The uncoated substrate appeared as a matte finish with a 60° gloss value of 2.3 which was visually vastly different than the Cerakote Trim Coat at 15.3.

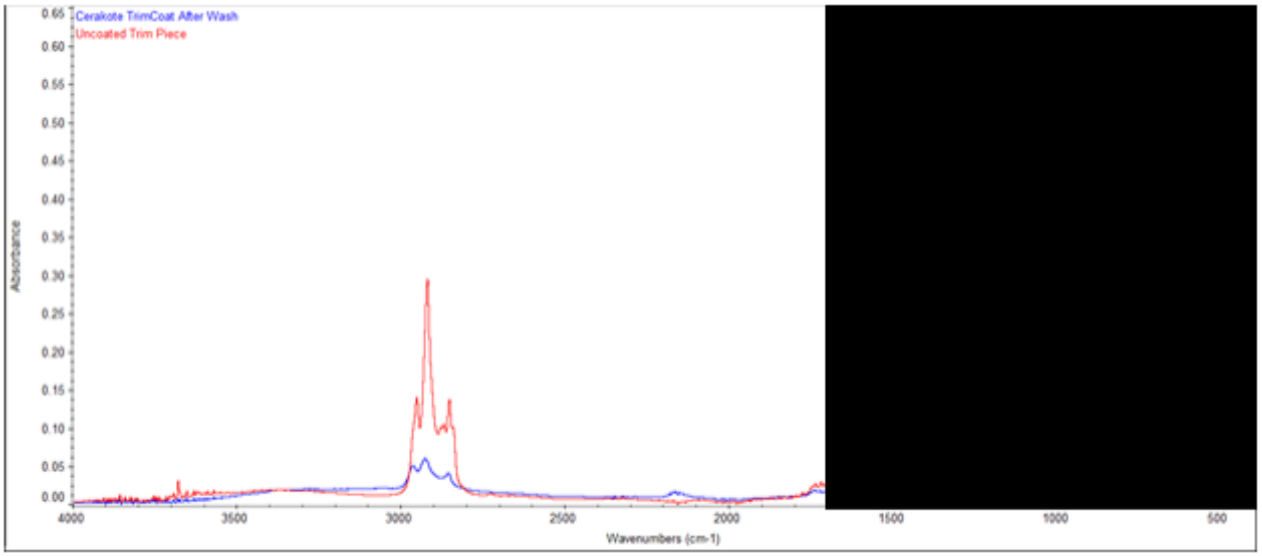

Figure 1: Shows the FTIR absorbance spectra of washed substrate and coating. Uncoated plastic in red and Cerakote Trim Coat in blue.

The main component in the LN series is the [redacted] in its absorbance spectra mainly at [redacted] The indicative peak at [redacted] is likely masked due to a shouldering effect of the [redacted]. To furthermore support the coating remained after wash, all mentioned peaks are absent in the uncoated portion of the plastic trim. These peaks in the spectra were used as evidence indicating [redacted] after the wash procedure.

	Sheen (20°)	Gloss (60°)	L	a*	b*
Uncoated	0.3	3.3	30.17	-0.15	-0.89
Cerkaote Trim Coat	1.8	13.5	29.18	-0.12	-0.58

Table 2: Shows the values for Sheen, Gloss, and color according to a calibrated X-rite AcuGloss gloss meter and a X-rite Ci6X spectrophotometer after the ISO modified testing procedure

The gloss value of Cerakote Trim Coat after the testing procedure was determined to be 13.5 which had an overall drop in gloss of 1.8 (or 11.7%). This decrease in gloss was considered not critical since the gloss and sheen values were still over 4x greater than the uncoated portion of the same piece after the wash.

An interesting observation worth noting was the slight increase in gloss and darkness (decreased L value) with the uncoated portion of the substrate after washing. This darker and glossier appearance was something seen with all uncoated plastic substrates in different car wash experiments as well. This was contributed to substantial washing of the substrate leading to a fully cleaned test piece. Without micro debris absorbing the light from the gloss meter, it will appear to have more gloss and visually look darker than previously measured.

Similar to the retained gloss, the darkness of Trim Coat was retained after the testing procedure. The formulation managed to measure darker than before the testing began. The difference in measuring color from before to after the testing procedure is most likely attributed to measuring at random spots on the same coated segment. Cerakote Trim Coat does have a slight decrease in darkness; however, it is not as light as the untreated segment. This difference further lends support to the differences between Cerakote Trim Coat and the uncoated substrate.

E. Conclusion

As evident by the FTIR provided in Figure 2 [redacted] is still present after the completion of the modified ISO testing method. The retention [redacted] in the coating can be visually confirmed as well by the gloss as well. Both coatings retained their gloss at significantly higher level than the uncoated substrate. The analysis from the FTIR in conjunction with the gloss reader fully supports that the coating lasted more than 80 continuous minutes in the testing chamber.