Wasatch Advanced Materials

Development Corporation

Report of Analysis- After-market Automotive Paint Sealants

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Introduction

For many years new car dealers have offered after-market paint protectants on vehicles. These products are designed to seal the surface of the paint and protect it against penetration by water, soil and other contaminants. One of the best-known of these products is Toughguard®, which as been sold for over ten years. Recently an new product (Product T) has been introduced that claims to offer similar performance to Toughguard®. We have performed a series of analyses to determine which of these two products offers a more durable protection for the finish.

Experimental Procedures

Since both products are offered with a five-year warranty, we had to develop a rapid experimental protocol that would simulate the effects of washing, cleaning the surface to remove tar and insect residues and other cleaning procedures.

1. To accomplish this, we used an acetone rinse to simulate the effects of detergents and solvents on the protectant on the paint surface. We applied each protectant to the surface of a silver chloride crystal according to each manufacturer's instructions. After both protectants had been buffed thoroughly, we determined the initial level of protectant as described below.

2. To detect changes in the level of protectant, we used Fourier Transform Infrared Spectroscopy (FT-IR). We monitored the absorption peak at 1260 cm^{-1} to determine the amount of protectant remaining after each acetone rinse. This peak is a sharp singlet that is characteristic of $Si\text{-}(CH_3)_2$ groups present in the sealants and allows us to determine their concentration on the surface.

3. To determine initial levels of protectant on the crystals, each sample was run and stored in digital format for later comparison to rinsed samples. The level of protectant remaining was determined by normalizing the peak intensity after each rinse to the peak intensity before any rinses were performed.

4. After the initial protectant level had been determined, we rinsed each crystal with acetone and then removed the acetone and any protectant that had been released from the surface using a clean absorbent wipe. We then ran the FT-IR spectrum of each sample after rinsing and stored the resulting spectrum for later analysis.

5. We applied a second acetone rinse to see if it would further reduce the level of protectant on the surface and ran another FT-IR spectrum.

6. After two acetone rinses we accelerated the solvent removal process by substituting ethanol for acetone. This resulted in a third FT-IR spectrum.

Results and Discussion

We have summarized the results of our analysis in the table below.

Treatment	Toughguard	Product T	Difference
One acetone rinse	40% remaining	25% remaining	60% more Toughguard remaining after one rinse
Two acetone rinses	20% remaining	15% remaining	33% more Toughguard after two rinses
Two acetone rinses plus one ethanol rinse	17% remaining	7% remaining	250% more Toughguard after three rinses

At each treatment stage the level of Toughguard is significantly higher than that of Product T. After the ethanol rinse, the residual of Product T was removed from the silver chloride crystal by soaking in ethanol and wiping the crystal clean with an absorbent wipe. In contrast, the residual Toughguard on the crystal after three rinses could only be removed by mechanical abrasion. This shows that <u>Toughguard provides a significant level of protection even after exhaustive treatment with solvent</u>, while Product T is removed readily.

Conclusion

These accelerated tests showed that Toughguard is significantly more resistant to the effects of solvent than Product T. We would expect that similar differences would be evidenced in typical use, with Toughguard providing a more durable finish than Product T.

About the author: Dr. Russell is the principal scientist for Wasatch Advanced Materials Development. He received his B.Sc. and M.Sc. in Chemical Engineering from MIT and his Ph.D. from the University of Utah in Materials Science & Engineering. He has held industrial positions with Exxon and Kodak Research and has conducted pollymer analyses for over twenty-five years.