

SunSpots®

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VOC Reduction and UV Stability of New Engineering Resins

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Abstract

Trends in styling continue to include metallic accents traditionally coming from paints and chrome plating. While paint and plating allow designers to achieve this desired look, both processes come with relatively high cost and are not environmentally friendly. VOCs (volatile organic compounds), chemical disposal, and no potential to recycle once the part is painted or plated are environmental concerns. In addition to wanting to eliminate VOCs from the painting process, there are new requirements for reductions in VOCs in the interior automotive cabin. New engineering resins have been developed which eliminate the need for painting and help to reduce interior VOCs. The UV stability of this solution is a potential concern when using traditional accelerated methods. This article looks at developing these resins and overcoming any UV stability concerns.

Background

Some resins, including engineering resins, require a secondary operation post molding to achieve the required aesthetics for appearance applications. The secondary operation could be painting or plating, for example, and this may include multiple steps to achieve the desired function and appearance. These secondary operations are required for a number of reasons, including:

- the desired color is not achievable in the resin
- the desired color is achievable, but the surface has flaws
- the desired color is achievable, but the UV stability is poor
- the desired color is achievable, but the gloss is not correct (too high or too low)
- the desired effect color is not achievable in the resin (metallic, pearlescent, etc.)

If any of the above conditions are encountered, painting or plating is often proposed as a solution. The costs associated with these secondary operations can be somewhat complex to capture. Not only are there the obvious costs associated with the materials and application of the painting or plating, but there also can be one or more pre- or post-steps in the painting or plating process. Etching the surface, applying a primer, flame, plasma or gamma treatments, heat curing, top coats, and so on all add



*Atlas UVTest gets safer,
greener and more ergonomic*

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Fundamentals of Weathering I	November 15	Hamburg, Germany	<i>Presented in German</i>
	November 17	Paris, France	<i>Presented in French</i>
Fundamentals of Weathering II	November 16	Hamburg, Germany	<i>Presented in German</i>
	November 18	Paris, France	<i>Presented in French</i>
Atlas/NIST Workshop on Photovoltaic Materials Durability	October 27–28, 2011	Gaithersburg, MD, USA	
ATCAE Solar 2011 (Atlas Technical Conference on Accelerated Ageing and Evaluation)	December 7–8	Berlin, Germany	
Online Webinars	October 13	Standards of Weathering (Free)	
	October 25	Environmental Durability of Photovoltaic Modules (Free)	
	October 26	Understanding the Relation of Reliability, Durability and Weatherability (Free)	
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Oct 24–27
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20. Leobener Kunststoff-Kolloquium

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Expo Solar 2012

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Seoul, Korea

PV Expo Japan 2012

Feb 29–Mar 2
Tokyo, Japan

NPE 2012

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Orlando, FL, USA
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incremental cost to the process. Moreover, people seldom include solvent and other chemical disposal costs to the entire process. If surface defects are observed after painting or plating, scrap costs are higher than unpainted/unplated part costs. Once painted or plated, the part is no longer able to be reground or recycled, making the final part less environmentally “green.”

Another drawback of using painting and plating as solutions is that they limit the number of potential resins for these applications. Many resins are not paintable or platable, and if the class of resins is, it is often through formulation modification which can further increase the cost of the base material even before the secondary operation is applied. It is much more desirable to solve these issues with resins, which can achieve the desired appearance right out of the mold without secondary operations.

Colorability, conventional UV stability, gloss control, and metallic effect colors were discussed at the SPE ANTEC® 2010 by the author [1]. In this article, we will focus on metallic resins to eliminate paint, test methods to determine volatile organic compounds (VOCs) for automotive interiors, formulation development to reduce those interior cabin VOCs, and UV testing issues and concerns with those formulations.

Continued on next page



German Color Fastness Committee (DEK) Festive Symposium – 100th Anniversary

October 11–12, 2011 • Erding, Germany

1) “Studies on High Accelerated Lightfastness Testing”

Presenter: Dr. Oliver Rahäuser, Atlas Material Testing Technology GmbH

2) “Performance Based Standards for Colorfastness to Light for Textiles – Challenges and Opportunities” (*presented in German*)

Presenter: Dr. Artur Schönlein, Atlas Material Testing Technology GmbH

Qualicoat Congress

October 27, 2011 • Munich, Germany

“Qualicoat Outdoor Weathering Protocol”

Presenter: Siegfried Rössner, Atlas Weathering Services Group

Atlas/NIST Workshop on Photovoltaic Materials Durability

October 27–28, 2011 • NIST Headquarters, Gaithersburg, MD

“Understanding Deficiencies of Current Standards to Guide Future PV Standards Development”

Presenter: Allen Zielnik, Atlas Material Testing Technology LLC

SSPC 2012 Education Program

January 30–February 2, 2012 • Tampa, Florida

“Fundamentals of Making Good Decisions in Coating Selection”

Presenter: Allen Zielnik, Atlas Material Testing Technology LLC

Metallic Molded-in-Color Eliminate VOCs from Painting

For the most part, painting and plating are the most common methods to achieve metallic finishes on appearance parts, particularly critical appearance parts like automotive interiors or appliances. Molded-in-metallic plastics were generally used for non-critical parts such as bottle caps, pen caps, disposable items, etc. Molded-in-color metallic plastics generally are characterized as having a duller metallic gray color, looking more sparkly than actually metal-like, and potentially having highly visible, very dark flow and weld lines depending on part geometry.

In acetal copolymer, work was undertaken to improve the appearance of molded-in-color metallic to reduce visible weld lines and increase the reflectance of the color. This was achieved through pigment technology, and mold design and processing. Aluminum pigments are typically available in three forms: cornflake, lenticular (silver dollar), and spherical. Cornflake pigments are characterized by a flat pigment geometry with an irregular edge. Lenticular pigments have flatter geometry with a smooth edge. Lenticular pigments are generally brighter than cornflakes due to the smoother flat surface. Brightness can be further increased by polishing the aluminum pigments. Spherical pigments are round and contribute more sparkle effect than true metal effect.

Flow lines or knit lines occur when two parallel polymer flow fronts come together in a part. Weld lines occur when polymer flow fronts meet head-on. These flow defects are present due to the part design and gate location and occur in uncolored or colored resins. Surface defects may not be visible with those materials, but properties may be reduced due to the flow and weld lines. Metallic pigments generally create noticeable flow and weld lines causing surface defects. Orientation of metallic flakes can change the reflectivity, making the flow or weld line more noticeable. Larger particle size pigments generally exhibit less noticeable flow and weld lines. A broader particle size distribution can also cause more noticeable flow or weld lines, as the smaller particles may be more concentrated at the flow fronts.

Combining metallic flake considerations and optimum tool design, satin chrome appearances can be achieved which mimic the appearance of painted or plated parts. In acetal copolymer, toner pigments can also be incorporated to achieve satin chrome, satin nickel, satin silver, and satin aluminum looks. These colors exhibit metallic brilliance with or without the speckled look. Flow and weld lines are still visible, but are not dark black in color, and typically are similar in color to the background so they are less objectionable.

UV stability of metallic colors is also important, both for interior automotive applications and for potential exterior applications, including automotive and non-automotive markets. In acetal copolymer, combining world-class UV technology with the metallic formulations provides molded-in-metallic colors that meet OEM requirements for interior automotive applications. Testing in the Atlas Xenon Arc Weather-Ometer® using test methods SAE J2412/J1885, Ford FLTM BO116-01, and VW PV1303 all show excellent performance over a wide range of colors, with color difference

Table 1

**UV Performance of Metallic UV POM Copolymer
Exposed using Solar Method ASTM G147 (GM 9538P)**

Sample	Exposure Levels			
	30 kL	55 kL	80 kL	105 kL
Satin Chrome	0.58	0.97	1.21	0.89
Chrome 2	0.20	0.23	0.19	0.11
Silver 1	0.21	0.21	1.26	0.38
Silver 2	0.34	0.52	0.28	0.33
Zinc 1	0.20	0.96	0.99	0.20
Zinc 2	0.33	0.55	0.35	0.10

Table 2

**UV Performance of Metallic UV POM Copolymer
Outdoor Direct Exposure SAE J1976**

Satin Chrome Exposure	Florida DE*	Arizona DE*
1 year	1.51	1.38
2 years	1.50	1.72

Table 3

Target Compounds for Vehicle Air Quality

Compound	Target Range (µg/m ³)
Ethylbenzene	< 4,000
Xylene	< 900
Tetradecane	< 350
Toluene	< 270
Styrene	< 250
Dibutylphthalate	< 240
Diethylhexylphthalate	< 130
Formaldehyde	< 100
Acetaldehyde	< 50

Table 4

Comparison of UV Test Methods

	General Motors, Chrysler, Others		Ford U.S.		VW	Honda	Toyota
Test Method	SAE J2412/1885		BO 116-01		PV1303	HES D6601	TSL0601G
Test Device	Xenon arc		Xenon arc		Xenon arc	Xenon arc	Xenon arc
Inner Lamp Filter	Quartz		Quartz		Borosilicate	Borosilicate	Borosilicate
Outer Lamp Filter	Borosilicate		Borosilicate		Soda Lime	Soda Lime	Soda Lime
Filter Lantern	None		SF-5		None	None	None
Exposure Energy	1,240.8 kJ/m ²		3,609.6 kJ/m ²		1,400 kJ/m ²	Varies	800 kJ/m ²
Exposure Time	ca 800 hrs		ca 1,200 hrs		ca 750 hrs 10 cycles	Varies	Up to 1000 hrs
Surface	Grain/stipple		Grain/stipple		Grained	Grained	High gloss
Wavelength	> 270 nm		> 335 nm		> 320 nm	> 320 nm	> 320 nm
Irradiation Control	@ 340 nm		@ 420 nm		@ 420 nm	@ 340 nm	@ 340 nm
Cycle	Light	Dark	Light	Dark	Light only	Light only	Light only
Irradiation	0.55 W/m ²	--	1.06 W/m ²	--	1.2 W/m ²	0.55 W/m ²	0.55 W/m ²
Black Panel Temp	89°C	38°C	89°C	38°C	n/a	89°C	89°C
Black Std Temp	n/a	n/a	n/a	n/a	100°C	n/a	n/a
Dry Bulb Temp	62°C	38°C	62°C	38°C	65°C	62°C	62°C
Relative Humidity	50%	95%	50%	95%	20%	50%	50%
Cycle Time	3.8 hrs	1.0 hr	3.8 hrs	1.0 hr	n/a	n/a	n/a
Referee Method	GM 9538P		None		None	None	None

values after exposure of less than 3.0 CIELab units and an AATCC gray scale rating of 4 or higher.

To confirm performance in the field, outdoor accelerated aging was performed under glass using test method ASTM G147 (GM 9538P). This test utilizes a tracking box that tracks the sun's trajectory in the Arizona sky with samples mounted below unglazed, laminated glass. Temperature in the box is not controlled, but had a maximum temperature reported as 102°C. Testing using this method was to a total exposure of 105 kL (kilo Langleys). All samples tested showed virtually no change after the 105 kL exposure. Data is shown in Table 1.

To complete the understanding of the UV performance of metallic acetal copolymer colors, satin chrome was exposed to direct sunlight in Florida and Arizona using test protocol SAE J1976. Direct exposure was conducted at an angle of 5° South on an open back rack. Testing has been completed for two years. Exposed samples show little change after two years of exposure in both climates. Color difference data is shown in Table 2.

Low VOC Formulations

Discussion up to this point has been focused on eliminating painting and plating for appearance parts. One of the drivers is to get "green" by eliminating VOCs from the painting process. For automotive interior applications in particular, we can further get green by also reducing VOCs from materials used inside the vehicle. VOCs from materials contribute to the "new car smell" and potentially to fogging of windows. Most OEMs have had test methods and requirements to characterize fogging in place for many years.

Concern with interior vehicle air quality and subsequent testing began with European OEMs over 10 years ago. It is this author's opinion that this concern was not related to any health risk, but rather trying to eliminate the new car smell in the interiors. This is further evident by the adoption of several qualitative smell tests such as VDA 270 from the German Association of the Automotive Industry. This test method deals with rating the odor of materials, with ratings such as "perceptible, not disturbing" and "very disturbing."

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Quantifying air quality in living spaces has gained momentum in Japan over the last decade. In Japan, the Ministry of Health, Labour and Welfare (MHLW) formulated indoor concentration guidelines for 13 VOCs due to “sick building syndrome.” The following quote defines sick building syndrome:

“There have been numerous reports on residents of newly built or recently renovated houses and buildings suffering from physical disorders, due to the increased air tightness of houses and the use of building materials and interior finishing materials containing chemical substances which evaporate and contaminate the air in the rooms. While this phenomenon involves diverse symptoms, as well as the mechanisms such as the onset are largely unknown and the factors are many and complex, such symptoms are generically called sick building syndrome.” [2]

Table 5

**GM 9538P Solar Testing Versus Xenon Arc SAE J2412
Low Emission, UV Stabilized Acetal Copolymer Resin**

Color	GM Code	GM 9538P 105 kL	SAE J2412 1,240.8 kJ/m ²
Gray	310N	1.34 / pass	3.10 / fail visual
Gray	311N	0.53 / pass	2.57 / fail visual
Gray	312N	0.58 / pass	3.87 / fail visual
Gray	313N	0.58 / pass	2.35 / fail visual
Ivory	314N	0.81 / pass	2.41 / fail visual
Tan	830K	0.38 / pass	2.23 / fail visual
Tan	831K	0.54 / pass	3.16 / fail visual
Brown	413P	0.39 / pass	4.43 / fail visual
Blue	400G	2.86 / pass	2.50 / fail visual
Red	4592	0.60 / pass	4.75 / fail visual
Maroon	108D	2.30 / pass	8.81 / fail visual
Black	848	1.12 / pass	0.65 / fail visual

Requirement DE* < 3 and pass visual

The Japan Automobile Manufacturers Association (JAMA) viewed passenger compartments in cars as living spaces and voluntarily worked on defining and reducing vehicle cabin VOCs before legislation was handed down by the MHLW. JAMA’s voluntary action began with model year 2007. Other countries in Asia quickly followed Japan’s lead, including China and Korea. U.S. OEMs are evaluating as requirements expand to vehicles exported to those regions.

VOCs in auto cabins come from a variety of sources including plastic parts, carpet, seat coverings, foams, adhesives, leather, wood, insulation, and so forth. Specific compounds contributing to VOCs include toluene, xylene, styrene, ethylbenzene, formaldehyde, vinyl monomers, etc. Note that each OEM will most likely have its own list of targeted compounds and levels.

VOC testing for auto interiors is generally a three-tiered process. The most important requirement, and the one addressed by JAMA, is testing air quality at the vehicle level. In these tests, fully assembled vehicles are placed in a chamber, with interior air samples collected at the driver’s breath location and analyzed. Table 3 shows a list of the common compounds being targeted and typical levels for vehicle level testing. Variables include temperature inside the vehicle, time at temperature, and sampling with or without ventilation.

The second level of testing is conducted at the component or part level. In this testing, the component or part is placed either in a chamber or a bag which is then heated. Samples of the headspace in the chamber or bag are collected and analyzed. A common chamber method test is VDA 276. A typical bag method is Japanese Automobile Standard (JASO) M902. In both methods, samples are heated at 65°C for 2 hours. Collected air is analyzed for VOCs.

The third tier of testing is at the material level. Here, tests such as VDA 277 (VOC by headspace GC) and VDA 278 (VOC by thermal desorption) are designed to measure the total VOCs from individual materials.

In the case of acetal resins, a specific test to measure formaldehyde emission is available as VDA 275 from the German Association of the Automotive Industry. In this test, two acetal injection molded specimens are suspended over water in a glass container. The water is present as it will absorb any formaldehyde emitted from the acetal resin. The container is heated in an oven for 3 hours at 60°C. After cooling, the water is analyzed for formaldehyde using the lutidine method, with results reported as ppm of formaldehyde.

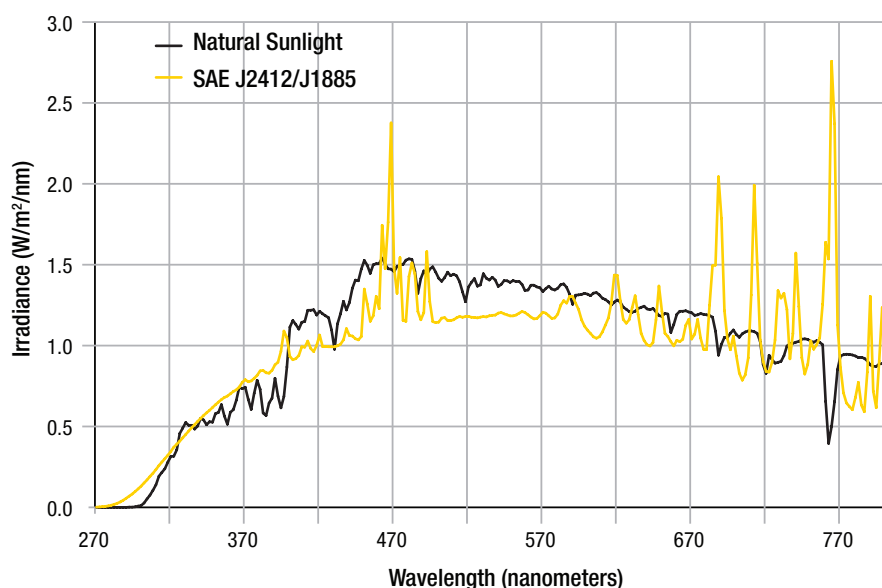
Low Emission UV Stabilized Acetal Copolymer

We have shown so far that it is possible to eliminate paint VOCs and reduce vehicle cabin VOCs by using molded-in-metallic acetal copolymer. It is also important to reduce cabin VOCs for conventional colors in UV stable acetal copolymer. One would anticipate an easier task compared to molded-in-metallic, UV stabilized, low emission acetal copolymer. While achieving low emissions as tested by VDA 275 was not a major hurdle, assessing the UV stability of these grades was an issue.

There are many patents covering the formulation of low emission, UV acetal copolymer. A typical formulation would contain UV absorbers, hindered amine light stabilizers, antioxidants, processing aids, formaldehyde scavengers, and other co-stabilizers. VOC reduction as measured by VDA 275 shows conventional UV colors exhibiting emissions in the range of 30 to 50 ppm or higher, as previously reported. Low emission, UV acetal copolymer in conventional colors can exhibit a tenfold reduction, with values typically in the 3 ppm range or less.

Figure 1

SAE J2412/J1885 vs. Natural Sunlight



The next step in development after achieving low VOC performance was to look at the UV performance of these colors. Testing was conducted using standard xenon arc accelerated method SAE J2412 for 1,240.8 kJ/m² exposure. To our surprise, UV performance was poor using this test method, with significant color change after exposure, and the onset of crazing/micro-cracking occurring in as little as 200 kJ/m² of exposure. Significant development work ensued to improve the UV performance in SAE J2412 while maintaining good low VOC performance. This was important for the U.S. OEMs that rely on this method, or modifications to this method. We quickly learned that no combination of UV stabilizers and co-stabilizers could optimize performance for both UV and low VOC.

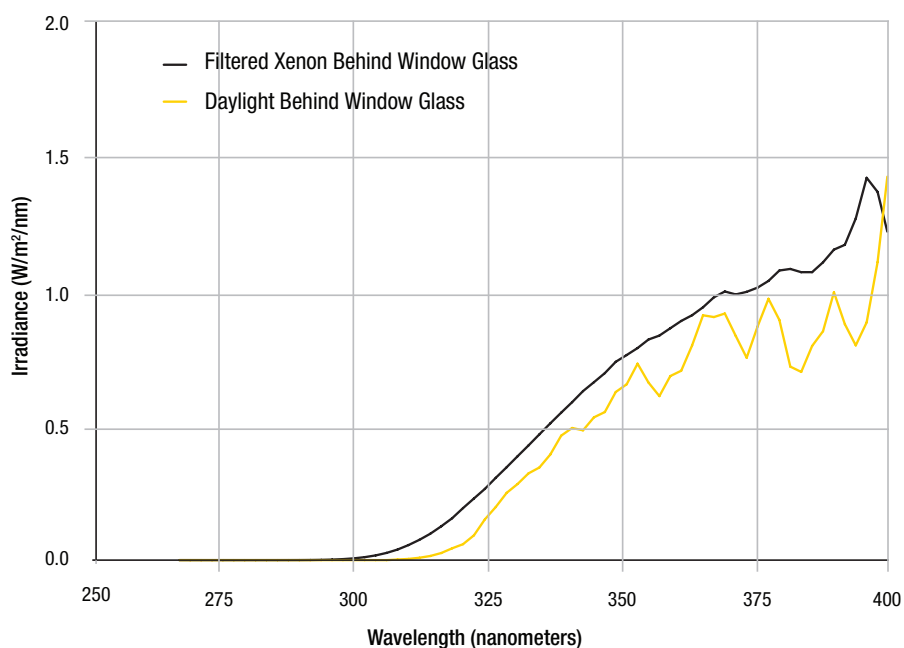
During this time, we did commercialize a low emission UV grade for one of the Asian OEMs on a limited basis, based on their internal testing and approval in Japan. No issues with UV performance were reported. Based on this, a review of accelerated UV test methods was conducted. A summary of that review is presented in Table 4. SAE J2412/J1885 was the first widely used accelerated xenon method for interior trim. This method

Continued on next page

was developed in the late 1980's in most part by General Motors and was quickly adopted by Ford and Chrysler. As shown in Table 4, as other OEMs have developed their own xenon methods over the years, the trend has been to use alternate light filtering methods to virtually eliminate wavelengths shorter than 320 nm. In contrast, SAE J2412/J1885 has wavelengths down as low as 270 nm present in the light source. The use of a 320 nm cut-off is supported by the lack of shorter wavelengths in natural sunlight and the use of improved UV automotive glass over the years. Figure 1 shows the spectral power distribution of the SAE J2412/J1885 xenon source versus natural sunlight [3]. It does show the higher amount and shorter wavelengths present in the xenon method versus sunlight. Figure 2 shows the spectral power distribution of a xenon lamp with the Borosilicate inner and Soda Lime outer filter configuration

Figure 2

Borosilicate/Soda Lime Filtered Xenon vs. Window Filtered Daylight



versus window filtered daylight. It is obvious from these graphs that the SAE J2412/J1885 does not match the actual sunlight conditions inside the vehicle as well as those methods with the 320 nm cut-off.

Most OEMs rely solely on the accelerated xenon method of their choice to predict long-term performance in the vehicle. General Motors, however, uses a referee method GM 9538P to validate the accelerated xenon results. This referee method is outdoor exposure in Arizona under glass using a solar tracking box to accelerate exposure by following the sun's trajectory throughout the day. Performance in this referee method is the ultimate criteria for UV performance and will override the results of the accelerated xenon testing per SAE J2412/J1885.

Based on all of this review, it became obvious that we needed to assess the performance of the candidate low emission, UV stabilized acetal copolymer formulation in accelerated xenon testing using the 320 nm cut-off, as well as the GM 9538P referee solar method. Accelerated xenon exposure was conducted using Ford FLTM BO116-01 and VW PV1303 methods. As expected based on the Asian OEM approval, UV performance for the low emission grade was excellent. Color change (DE*) after exposure was less than 1.0 CIELab units with no issue with crazing/micro-crack formation. This quickly explained why the Asian OEM that completed UV testing itself had no issue with the UV stability of the product.

Furthermore, GM referee solar method GM 9538P was conducted on a range of 12 GM

colors. SAE J2412/J1885 was also conducted on this same sample set. Data in Table 5 shows that while the accelerated xenon method predicted failure due to high DE* or poor visual performance, the solar method showed excellent performance. GM engineers were consulted on this finding and they did explain that on rare occasions the accelerated xenon method SAE J2412/J1885 has predicted a false failure after the solar testing results were obtained. They agreed to not require xenon accelerated testing and only rely on GM 9538P data. Chrysler followed suit, with reference to the ASTM G147. Accelerated UV testing is not an issue with other OEMs in all three regions of the world.

Conclusion

Generally parts suppliers paint or plate plastic parts if the desired color is not achievable, if the color is achievable but has surface defects, if the UV stability is poor, if the gloss is not correct, or if the metallic effect is not achievable. Painting or plating requires one or more secondary processes which require part handling and added cost. Parts that are painted or plated can no longer be reground or recycled and are not considered “green.” It has been shown that engineering resins can be formulated to eliminate the need for painting or plating.

In the case of metallic colors, satin metallic appearances are available and commercial for critical appearance applications such as automotive interior applications. Parts include door handles, trim bezels, speaker grilles, and knobs. The combination of formulation, mold design, and processing makes this possible. Cost savings are in the \$1 to \$4 range per part, which can easily exceed \$1 million in total savings for one application alone. Furthermore, we have shown that UV stabilized molded-in-metallic acetal copolymer formulations can be created that significantly reduce VOCs from the material itself. These options allow the OEM to get “green” by eliminating painting, to save “green” through part cost reduction, and to keep “green” by utilizing low emission acetal copolymer formulations. Additionally, it has been shown that conventional Xenon arc accelerated UV testing SAE J2412 predicts a false failure with low emission, UV stabilized acetal copolymer and should not be used to predict UV performance. xenon methods with a wavelength cut-off of 320 nm or above, or actual solar testing, should be used to assess the UV performance of these grades.

References

- [1] B. Mulholland, “Get Green Without Paint: Molded-in-Metallic Engineering Resins Appearance Applications,” Society of Plastics Engineers, Proceedings, ANTEC® 2010
- [2] “JAMA Voluntary Action Program to Reduce VOCs in Passenger Compartment,” JAMA Report No. 98, JAIA Translation (year unknown)
- [3] “Sunlight vs. Artificial Light Sources,” Brochure, Atlas Material Testing Solutions

Data Tables

Product performance and material data values included in this article are either based on evaluating laboratory test specimens and represent data that fall within the normal range of properties or were compiled from various published sources. To the best of our knowledge, the information contained in this article is accurate; however, no representation is made as to its suitability in any specific application for establishing maximum, minimum, or ranges of values for specification purposes.

Color data presented in the accompanying tables have been calculated under illuminant “D-65,” 10° observer, specular included, expressed in CIELab units, unless otherwise noted.

The foregoing represents proof-of-concept data on small-scale replicas and are approximate in nature. Properties of molded parts can be influenced by a wide variety of factors including, but not limited to, material selection, formulations, part design, processing conditions and environmental exposure. Any determination of the suitability of a particular material or composite and part design for any use contemplated by the user is the sole responsibility of the user.



The Atlas® UVTest: Safe, Green, and Ergonomic



For decades, fluorescent/UV weathering testing equipment and technology remained relatively unchanged. The irradiance controlled models introduced in the 1990s evolved from designs from the 1970s without much innovation. This is largely because instrument manufacturers were focused on maintaining compatibility with test results from these legacy products.

In 2009, Atlas departed from this approach by introducing the next generation fluorescent/UV weathering tester, the UVTest. It was designed to fit customers' need to maintain industry standard performance while incorporating useful incremental innovations that changed outdated designs and old ways of thinking. These innovations were geared toward improving the user experience, reducing the environmental footprint, and enhancing safety.



UVTest calibration safety port

Safety Improvements

Most noteworthy in the UVTest's design are the improvements to the safety shortcomings of legacy designs — particularly the incorporation of optical calibration safety ports. This new feature eliminates the need to disable door interlock safety features and open the test chamber door during irradiance calibration. With the optical calibration safety ports, the door remains closed during irradiance calibration, protecting the operator from potentially harmful UV radiation.

The UVTest also comes with an optional integrated stacking solution. While competitive devices are placed on a crude shelving system, the UVTest was designed specifically for stacking, and meets all applicable international tilt-test and leak protection directives. With stacked units from other manufacturers, the lower unit can be ruined if a system failure causes a leak in the upper unit; this is not the case with the UVTest.



Stackable frames

Green Design

The UVTest was designed with the environment in mind. Traditional test methods specify 12 high-flow water nozzles for deionized (DI) water spray. These high-flow nozzles remain the standard today, meaning current devices consume over 7 liters of DI water per minute during spray cycles, which can equate to thousands of liters of DI water consumption per month. For laboratories with a limited supply of DI water, this can get expensive. The cost of installing a suitable DI water system could easily exceed the cost of a new UVTest. The UVTest DI water recirculation system solves this problem. It filters and polishes the drain water from the UVTest, then supplies it back to the sprays. Alternately, the positions of the UVTest spray manifolds are adjustable, providing the opportunity to install different low-flow nozzles at the proper distance from the specimens. These exclusive options can save users thousands of dollars in initial and ongoing operating costs.

Ergonomic Features

In addition to its modern industrial design, the Atlas UVTest incorporates a number of features that make operating the machine easier and more efficient. To start with, multiple language selection allows most lab technicians around the globe to interface with the controller in their native language. This eliminates the requirement that an operator must speak English, and reduces chances for error. The controller is also preprogrammed with commonly used tests for easy start-up. Users can also copy/save their own custom versions of tests. All of this functionality is contained within one convenient touch screen interface. Furthermore, regular maintenance messages can be programmed to help users keep the UVTest running at optimal condition.

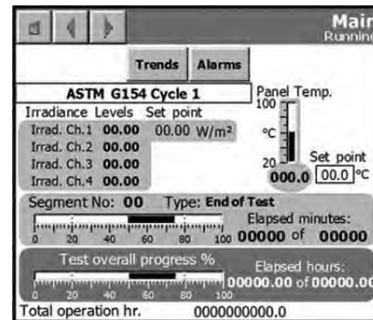
The specimen retaining rings have also been redesigned for a more comfortable grip and faster loading/unloading of specimens. This seemingly simple improvement makes a



UVTest with recirculation system

significant difference. Prior designs were uncomfortable to handle for repetitive loading and unloading, if not downright painful. The new Atlas design is easy to handle and saves time in the process.

Safety, green design, and ergonomics are all important elements for new test equipment in today's modern laboratories. The Atlas UVTest is the most advanced fluorescent/UV weathering device in the world, and the only one with these features. ■



New Interface and Software Enhance Weather-Ometer® Performance

With a new user interface and software, Atlas' Ci4000 and Ci5000 Weather-Ometers are even easier to use. The new user interface (UI) offers a number of improvements, including:

- A reduction in the number of "touches" needed for the operator to navigate through the system
- Simpler software structure to include more languages in the future
- Increased screen size with larger touch buttons
- Faster response time and screen transitions
- Improved trend plot functionality
- USB connections for standard data acquisition functions

The new UI was incorporated into Ci4000 and Ci5000 instruments in August 2011; a date for incorporation into the Ci3000 models is pending.

The features of the new UI can also be installed as a retrofit upgrade kit to all existing Ci4000 and Ci5000 Digital Control System (DCS) instruments. This includes Ci4000s manufactured after June 2006, and Ci5000s manufactured after November 2007. The upgrade kit is available for order under Part No. 20019400. Please note that the upgrade must be performed by an Atlas Technical Service representative.

This latest UI enhancement is also the platform for **WXView (WeatherView)**, a revolutionary new data acquisition (DAQ) software featuring a remote access control and monitoring tool. WxView provides:

- User interface for efficient transfer of information, including test set point parameters, control system data, etc. in tabular and trend plot form
- Local area network (LAN) interface for remote access
- Remote functionality allowing for multiple networked Weather-Ometers to be accessed
- The ability to create and apply a unique identification, or "name," to each Weather-Ometer

If you have questions about the new enhancements, please contact Matt McGreer at matt.mcgreer@ametec.com or your local sales manager. ■



Atlas® Earns Marks & Spencer Approval

Three Atlas large-capacity textile lightfastness testers now have the Marks & Spencer stamp of approval. The Atlas Xenotest® 220 and 220+ and the Atlas Ci3000+ Fade-Ometer® now meet C9 (colorfastness to light) and C9A (colorfastness to wet light) test methods.

The instruments underwent approval testing at the INTERTEK laboratory in the UK — Marks & Spencer's preferred accredited laboratory.

Atlas launched the Xenotest 220 and 220+ in mid-2010. These new models both feature a premium on-rack light and temperature sensor as well as non-aging optical filter technology. Additionally, both chambers have a generous 38 sample test capacity, providing users nearly double the testing capacity in the same footprint as their predecessor, the Xenotest 150 S+. Coupled with their efficient utility usage, the Xenotest 220 and 220+ are today's most economical lightfastness instruments available.

Marks & Spencer tested the Ci3000+ Fade-Ometer using a newly introduced quartz inner/CIRA on soda lime outer filter combination.

For further information on these testing instruments and services, visit www.textiles.atlas-mts.com. Specific inquiries may be sent to atlasinfo.us@ametek.com. ■

Atlas Introduces Thallium-Free Bulbs

Atlas has partnered with our UVB bulb manufacturer to qualify new, thallium-free UVB-313 bulbs for use in the UVTest and other fluorescent/UV testing applications. During the development process, our optical engineers worked closely with the bulb manufacturer to optimize the spectrum for improved conformity to the spectral output specified in the most popular fluorescent/UV test methods. The result was a better match to recently established UVB-313 bulb performance standards set in the industry.

For decades, Atlas has provided UVB bulbs with spectral output consistent with legacy test performance dating back to the 1970s. UVB-313 legacy bulbs are still available but only for a limited time. For more information, contact your local area sales manager or e-mail us at atlasinfo.us@ametek.com.



AWSG Fees Hold Steady for 2011

As costs on products and services continue to rise, Atlas Weathering Services Group (AWSG) is pleased to have held prices steady for our customers. Fees for our popular exposures and services through 2011 remain unchanged from 2010. AWSG continues to monitor and control operating costs through advancements in our internally designed database systems and streamlined processes.

AWSG offers a full suite of services to meet all of your weathering/durability testing needs. Companies across all industries increasingly rely on Atlas to provide the highest quality weathering testing services available, all designed to accurately simulate true end-use conditions and meet global weathering standards:

- EMMAQUA®
- Ultra Accelerated Weathering System*
- Solar Testing*
- True Benchmark Subtropical and Desert Outdoor Testing

**Pricing provided upon request*

AWSG offers corporate discounts in the form of Atlas Preferred Vendor Agreements. Contact us today to learn more about this special program and how your company could benefit from joining.

For further pricing or corporate discount information, or to request a copy of the 2011 Fee Schedule, please contact your local representative or John Wonders at 800-255-3738 or john.wonders@ametek.com. ■



Solar Testing Shows No Sign of Slowing

Atlas® Expands to Meet Industry Demands

Open for a year now, the Atlas Solar Test Center is busier than ever. To accommodate the ever-growing demands of customers in the solar energy industry, we continue to expand our testing capabilities in this area.

The Atlas Solar Test Center is an ISO 17025, Underwriters Laboratories (UL), and Solar Rating and Certification Corporation (SRCC) accredited laboratory offering a complete portfolio of testing services to evaluate the performance, durability and reliability of solar cells, modules, complete arrays, concentrated solar power products, and solar thermal collectors.

What's New?

- We are doubling our solar thermal testing capabilities in response to a large volume of requests for SRCC Standard 100, ISO 9806, and ASHRAE Standard 93 testing.
- We now offer electroluminescence testing. The photographic electroluminescence of a photovoltaic device provides details about efficiency-degrading mechanisms in a cell or panel.
- We have increased our NOCT testing area in response to high demand.
- We are expanding our Solar Test Center, allowing for future growth and increased capacity for the Atlas 25+ testing program and solar chamber testing.

Photovoltaic Testing Capabilities

The expansive Atlas Solar Test Center is located in the pristine Arizona desert, which features high levels of solar radiation and elevated temperatures. The site includes both indoor and outdoor testing capabilities, including:

- Over 40 acres of outdoor test area to supporting the real-time testing of PV glass, backsheet, top sheet, inverters, cell, module and functional grid-tied arrays
- Fixed-angle, single-axis and dual-axis tracking mounts
- Comprehensive state-of-the-art weather station providing solar and climatic data
- Six luminary SolarConstant Class B steady-state simulator
- SolarClimatic chamber for temperature cycling under solar loading
- Large walk-in environmental chamber with four luminary simulator for temperature cycling with or without solar loading for large modules
- UV pre-conditioning chambers
- Large walk-in corrosion chamber
- I-V curve tracing measurements
- FLIR thermal imaging and analysis

Solar Thermal Testing

Atlas is ISO 17025 and Solar Rating and Certification Corporation (SRCC) accredited to perform solar thermal collector efficiency testing.

- SRCC Standard 100 – “Test Methods and Minimum Standards for Certifying Solar Collectors” certification testing
- Accredited testing per ISO 9806 – “Test Methods for Solar Collectors”
- ASHRAE Standard 93 – “Methods of Testing to Determine the Thermal Performance of Solar Collectors”
- Atlas also provides optical properties measurements including solar transmittance, reflectance, and emissivity per ASTM and ISO standards

Additional Solar Products and Services

Atlas provides many additional services and products, leveraging industry leadership in solar radiometry, climate data acquisition, and optical properties measurements.

- Spectroradiometric measurements
- Reference cell and silicon cell measurements
- Continuous temperature, reference cell, and power output for complete systems
- Instantaneous or continuous I-V curve tracing measurements
- ISO-accredited solar simulator (steady state and flash) classification measurements per IEC and ASTM standards
- Solar weather station for on location measurement of solar and climatic parameters

To discuss how Atlas can help meet your solar testing needs or to receive a quotation, please contact John Wonders at 800-255-3738 or john.wonders@ametek.com. ■



Join Us at the ATCAE Solar Conference

Berlin, Germany, December 7–8, 2011

Representatives from the global solar energy industry will gather in Germany in December to discuss the latest developments, research, and innovative approaches to address environmental durability, aging behavior, and service life of materials, components, and PV modules. During the two-day Atlas Technical Conference on Accelerated Ageing and Evaluation (ATCAE) at Berlin's Hotel Concorde, participants will hear from and interact with experts from the solar energy industry, material suppliers, research and test institutes, and insurance and technology providers.

The conference program to date features the following speakers and presentations:

- » **Dr. Murray Cameron**, EPIA » *Confronting the Durability Challenges as the Global Solar Business Rapidly Matures*
- » **Dr. Thomas Reichert**, Fraunhofer ICT » *Philosophy and Concepts of Environmental Simulation and Weathering*
- » **Dr. Marcus Heindl**, SKZ Süddeutsches Kunststoff-Zentrum » *Weathering Testing of Polymeric Materials for Use in PV Applications*
- » **Dr. Gernot Oreski**, PCCL Polymer Competence Center Leoben GmbH » *Service Life Testing of Backsheets and Encapsulants for Use in PV Modules*
- » **Dr. Hubert Ehbging**, Bayer MaterialScience AG » *Innovative Polymer Application for the Solar Industry: How to Prove Durability*
- » **Dr. Jürgen Arp**, PV Lab Germany GmbH » *Market Expectations for PV Module Quality and Quality Management*
- » **Dr. Werner Herrmann**, TÜV Rheinland Energie und Umwelt GmbH » *Comparison of Outdoor Weathering and Accelerated Laboratory Testing of PV Modules*
- » **Michael Köhl**, Fraunhofer ISE » *Realistic Conditions for Lifetime Testing of PV Modules*
- » **Allen Zielnik**, Atlas MTT, LLC » *Accelerated and Rational Environmental Durability Testing of PV Modules*
- » **Matteo Paleari**, Underwriters Laboratories » *Current Photovoltaic Standards — Polymeric Requirements and Test Methods*
- » **Jörg Althaus**, TÜV Rheinland Energie und Umwelt GmbH » *The Impact of NH₃ and Salt on the Ageing of PV Modules*
- » **Dr. Roland Steim**, Konara Technologies GmbH » *Lifetime and Environmental Durability of Organic PV (OPV) Products*
- » **Dr. Tony Sample**, European Commission Joint Research Centre » *Failure Modes Observed in Real Use and Long-Term Exposure*
- » **Dr. Omar Stern**, GE Global Research » *Long-Term Stability of Cadmium Telluride PV Modules*
- » **Dr. Ulrich Bohnert**, Munich Re » *PV Installations — Bankability and Insurability*
- » **David Burns**, 3M » *Practical Considerations in Predicting the Service Life of Solar Modules and Components*
- » **Ryan Gaston**, Dow Solar Solutions » *PV System Reliability Methodology*
- » **Dr. Jong In Park**, Korea Testing Laboratory - KTL » *Modeling the Performance Degradation of a CIGS-Based PV Module Exposed to Damp Heat with Nonlinear Random-Coefficients Model*
- » **Dr. Jun Seok Park**, Korea Testing Laboratory - KTL » *The State of the Art for the Korean PV Industry – Government and Industry Efforts to Ensure Durability and Reliability*
- » **Kent Whitfield**, Solaria Corporation » *Crystalline Silicon Damp Heat With and Without Voltage Bias — History and Field Connection*

Installations and materials generating power from the sun are typically expected to last 20 or 25 years. Appropriate accelerated testing of the long-term durability of materials and components used as well as the complete solar systems is crucial in product development, quality control, and certification testing. The Atlas conference contributes to ongoing developments in this area.

R&D and QA staff, experts and managers from the solar energy industry, as well as financial managers faced with warranty, reliability, and product longevity issues should not miss the ATCAE Solar conference.

For further program and registration information, please visit www.atlas-mts.com or contact Christiane Landgraf at christiane.landgraf@ametec.de. ■



New Landing Pages Offer Product Information at a Glance

Atlas® has launched two new landing pages, giving you all the information you need in one place. The pages — featuring our new Sealed Lamp and our Consumer Goods solutions — are now live!

SEALED LAMP

www.sealed-lamp.atlas-mts.com

This new landing page focuses on industries involved in Weather-Ometer® testing. It was designed in response to the positive feedback Atlas received after our new Sealed Lamp was featured in a recent *Sun Spots*® newsletter article.

After years of research on filters and material durability, Atlas developed the Sealed Lamp assembly, allowing users to get more uptime from their instruments, since tests do not need to be disrupted before the end of the 2,000-hour lifetime of the lamp assembly. This new lamp is sold as one component, with no assembly or disassembly required, and can be used with all versions of the Ci35/Ci65 and Ci4000 Weather-Ometers.

The new Sealed Lamp website offers valuable information on the availability of the lamp, its features, possible filter combinations, and frequently asked questions, as well as a contact form to order the lamps.

CONSUMER GOODS

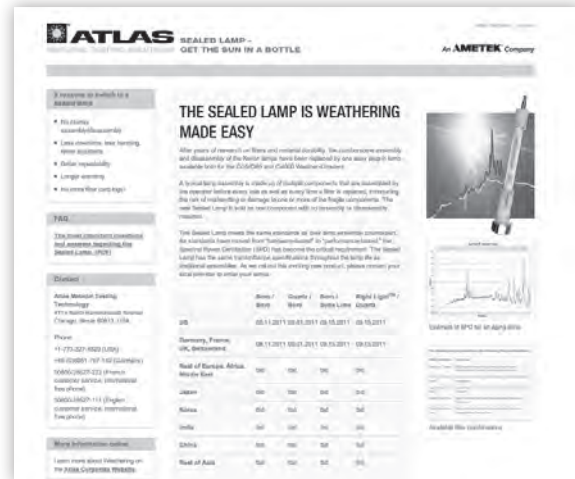
www.consumer-goods.atlas-mts.com

Atlas knows that the success of today's consumer goods — including beverages, foodstuffs, personal care, and household products — is highly dependent upon their packaging appearance and performance. Our new Consumer Goods landing page assists consumer goods manufacturers with solutions that meet their photostability testing needs.

This page highlights the Atlas products and services based on xenon technology that address the challenges of realistic consumer goods testing. Xenon is recognized worldwide as the light technology with the best full-spectrum match to solar radiation. Creating realistic light conditions is simply a matter of using the right optical filters for the specific application — e.g., daylight, daylight behind window glass, store light.

After working with you to determine the equipment that best meets your testing needs, Atlas offers guidance in applying the right test conditions. We're here to help you achieve your goals in new product development and determining product shelf-life at the point of sale. Log on today to learn more!

For further information on either landing page, visit Atlas at www.atlas-mts.com. Specific inquiries on instruments, services, and consulting may be sent to atlasinfo.us@ametek.com.



SunSpots



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