

# CONSUMER GOODS TESTING



Realistic Light Stability Testing of Ingredients,  
Products and Packaging

# Packaged Consumer Goods

## Challenges of Product Photostability

The success of today's consumer goods like drinks, foodstuffs, personal care or household products is highly dependant on its packaging. Transparent packaging is the preferred choice to attract the buyer by the color of the product. An attractive color is often the key criterion which influences spontaneous purchasing decisions for a certain product or brand.

Wherever there is light however, there is a risk for photo-induced reactions that can impact colorants, vitamins, flavors, scents or product homogeneity.

Covering the full spectrum UV-VIS-IR is critical. Some ingredients may be sensitive to the UVB range, while others react to longer wavelength UVA or VIS radiation, such as colors, flavors or fragrances. Providing the infrared part of the spectrum is needed to achieve realistic specimen heating.



2

## Light Sensitive Ingredients of Consumer Goods

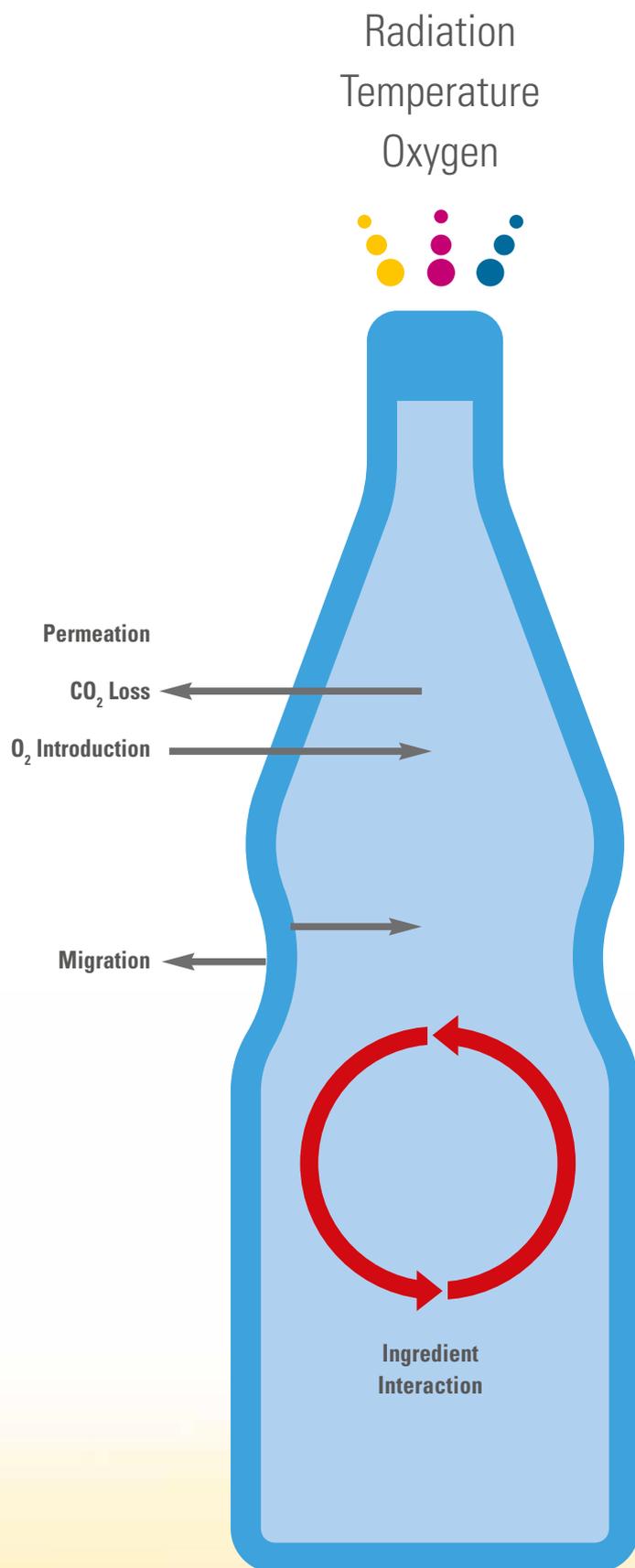
| Ingredient                 | Degradation  | Risk   | Examples   |
|----------------------------|--|--|--|
| Natural / Synthetic Colors | Photooxidation, destruction of $\pi$ -electron systems; potential interaction with Vitamin C | Fading<br>Loss of saturation<br>Color change (Hue shift)   | FD&C blue #1, FD&C red #40, D&C violet #2, D&C red #33, Azo-Colors           |
| Vitamins                   | Photooxidation   | Decreased vitamin content<br>Decreased efficacy  | Vitamin A, B2 (riboflavin), B6, B12, C, folic acid                           |
| Flavors / Fragrances       | Photooxidation, reactions via free radicals  | "Off" flavors / odors even at very low concentrations<br>Production of sulfuric-smelling compounds | Citral, limonene, aspartame, hops, hops extractions, unsaturated fatty acids |
| Emulsions                  | Thermal cycling, photooxidation  | Loss of structure<br>Separation of emulsion<br>Loss of colloidal stability                         | Proteins, colloids, fatty acids, oils  |

# Environmental Stress

## Three Important Factors

### Important Stress Factors:

- Radiation, temperature and oxygen
- Photostability of independent vs. combined ingredients under UV or VIS light
- Potential permeation of oxygen into the packaging, or loss of product ingredients; e.g. CO<sub>2</sub>, flavors, or scents
- Migration of chemical compounds from packaging



# Realistic Testing

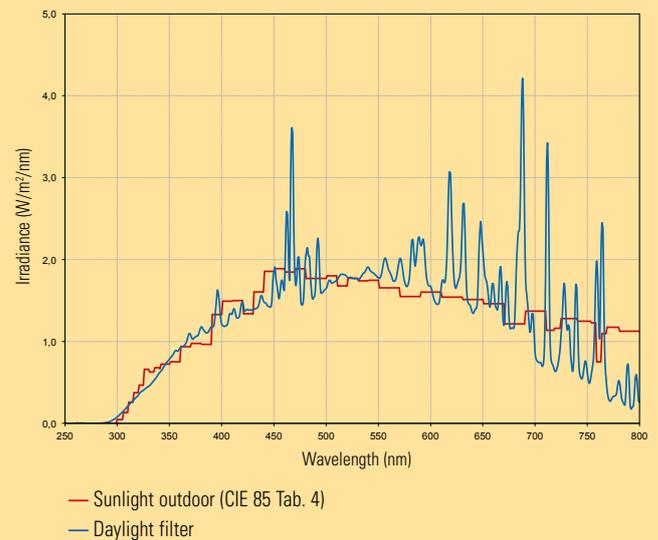
## Reliable Product Development And Support of Shelf-Life Claims

### Three Relevant Light Conditions in Photostability Testing

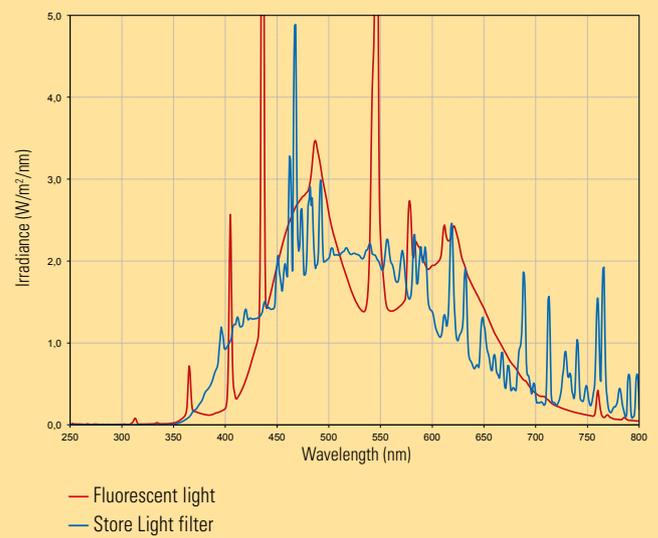
Consumer goods are typically exposed to either of the following light conditions:

- Outdoor Sunlight (Transportation/Storage)
- Indoor Sunlight (Display/End-use)
- Artificial Light (Display/Production)

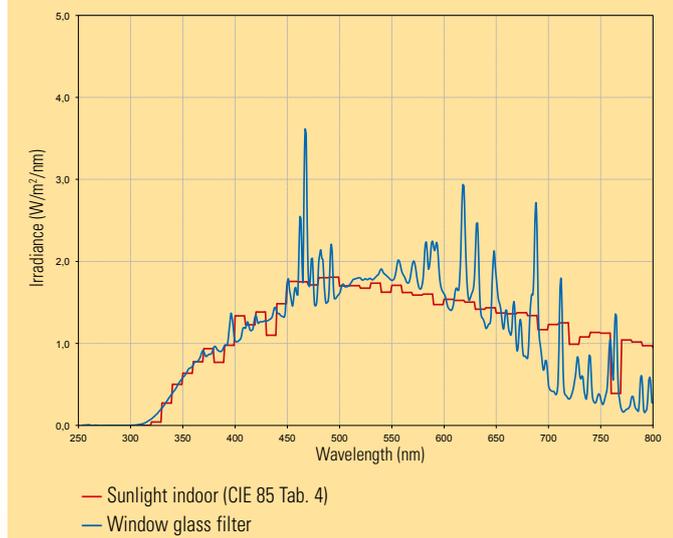
Filtered Xenon light: realistic simulation of outdoor sunlight  
**XENOCHROME 300 vs CIE85 Daylight**



Filtered Xenon light: realistic simulation of artificial supermarket light  
**Store Light vs Supermarket Fluorescent Light**



Filtered Xenon light: realistic simulation of indoor sunlight  
**XENOCHROME 320 vs CIE85 Daylight behind Window Glass**



# Product Exposure

## Conditions Inside the Product Chain

| Filtered Xenon light: realistic simulation of outdoor sunlight<br><b>XENOCHROME 300 vs CIE85 Daylight</b> |                            |                     |                           |
|---|----------------------------|---------------------|---------------------------|
|   | Storage/<br>Transportation | Display/<br>End use | Display/<br>Production    |
| Spectra   | Outdoor Sunlight           | Indoor Sunlight     | Fluorescent/<br>LED lamps |
| UV Cut-on   | ~ 295 nm                   | ~ 320nm             | ~ 360–390nm               |
| E (300-400 nm) [W/m <sup>2</sup> ]  | 45–60                      | 15–40               | –                         |
| E (300-800 nm) [W/m <sup>2</sup> ]  | 400–550                    | 100–350             | 20–100                    |
| Product Temperatures [°C]   | 20–45                      | 20–35               | 20–25                     |
| Relative Humidity [%]   | 20–70                      | 30–50               | 30–50                     |

| Air Temperature Range |          |
|-----------------------|----------|
| SunCool Beta+ FD      | 15–70° C |
| SunCool XXL+ FD       | 15–70° C |
| SunCool XLS+          | 10–70° C |
| Ci-Series             | 15–80° C |

Adapted chillers maintain realistic product temperatures even at high irradiance levels.



Air-cooled rotating rack test chamber including xenon lamp, optical filter lantern, and light monitor



Sample rack with packaging (optional)

# Atlas Full-Spectrum Xenon Equipment

## Rotating Rack Technology

Atlas full-spectrum xenon instruments enable you to test your products realistically under accelerated conditions. Typically with time-saving factors >10 vs real time. They can save you money by helping you choose the right ingredients and packaging materials, as well as backing up shelf-life claims.

### Xenotest® Beta+ FD

The latest air-cooled xenon technology for photostability testing of packaged consumer goods.

#### Features & Benefits

- Large 4000 cm<sup>2</sup> rotating rack for premium performance
- Economical non-aging filters Outdoor / Indoor / Store Light
- Irradiance range 25–200 W/m<sup>2</sup> (300–400 nm) for high acceleration
- Chamber Air Temperature range 15–70° C
- Easy to use with online programming & monitoring Add-ons
- Bottle Rack / Packaging Rack
- Maximum Load 20 kg



### Ci Weather-Ometer® Racks

#### Features & Benefits

- Largest capacity instrument in the market
- Custom-engineered racks for special applications
- Rotating rack and specimens provides unmatched uniformity
- Irradiance range 30–135 W/m<sup>2</sup> (300–400 nm)
- Temperature range 15–80° C
- Several filter options for multiple light environments



# Atlas Full-Spectrum Xenon Equipment

## Flatbed Technology

### SUNTEST® XXL+ FD

#### Features & Benefits

- Extra large flatbed technology with 3000 cm<sup>2</sup> specimen table
- Economical non-aging filters Outdoor / Indoor / StoreLight
- Irradiance range 25–65 W/m<sup>2</sup> (300–400 nm)
- Chamber Air Temperature range 15–70° C
- Easy-to-use with online programming and monitoring Add-ons
- Maximum Load approximately 20 kg



### SUNTEST® XLS+

#### Features & Benefits

- Compact benchtop model with 1100 cm<sup>2</sup> specimen table
- Economical non-aging filters Outdoor / Indoor / Store Light
- Irradiance range 25–65 W/m<sup>2</sup> (300–400 nm)
- Chamber Air Temperature Range 10–70° C
- Easy-to-use with online programming and monitoring Add-ons



**Atlas offers more than testing instruments.** From technical advice to final test method implementation, Atlas provides the support you need when determining the right weathering testing solution for your products. For more information, please contact your local Atlas sales office or visit us at [www.atlas-mts.com](http://www.atlas-mts.com).

|  | Xenotest Beta+ FD   | SUNTEST XXL+ FD   | SUNTEST XLS+   | Ci4000   | Ci5000   |
|--|---|---|--|--|--|
| Light Source   | 3 × 2200 W<br>Air-Cooled Xenon Arc Lamp   | 3 × 1700 W<br>Air-Cooled Xenon Arc Lamp   | 1700 W<br>Air-Cooled Xenon Arc Lamp  | 6500 W<br>Water-Cooled Xenon Arc Lamp  | 12000 W<br>Water-Cooled Xenon Arc Lamp   |
| Guaranteed Lamp Life   | 1500 Hours  | 1500 Hours  | 1500 Hours   | 2000 Hours   | 2000 Hours   |
| Filters  | Non-aging XENOCHROME (300/320), and Store Light   | Non-aging Daylight or Window Glass and Store Light  | Non-aging Daylight or Window Glass and Store Light   | Interchangeable Inner and Outer  | Interchangeable Inner and Outer  |
| Irradiance Control   | Automatic control at 300–400 nm or at 300–800 nm  | Automatic single point control at 340 nm or 420 nm or 300–400 nm  | Automatic control at 300–400 nm/340 nm or 300–800 nm/Lux                                   | Automatic single point control at 340 nm, 420 nm, 300–400 nm or LUX; optional monitoring at 2nd point              | Automatic single point control at 340 nm, 420 nm, 300–400 nm or LUX; optional monitoring at 2nd point              |
| Irradiance Range   | Bottle Rack<br>25–200 W/m <sup>2</sup> (300–400 nm)<br>200–950 W/m <sup>2</sup> (300–800 nm)<br>Packaging Rack<br>15–120 W/m <sup>2</sup> (300–400 nm)<br>200–950 W/m <sup>2</sup> (300–800 nm) | 25–65 W/m <sup>2</sup> (300–400 nm)<br>0.26–0.60 W/m <sup>2</sup> (340 nm)<br>250–650 W/m <sup>2</sup> (300–800 nm) | 25–65 W/m <sup>2</sup> (300–400 nm)<br>250–600 W/m <sup>2</sup> (300–800 nm)               | 30–140 W/m <sup>2</sup> (300–400 nm)<br>0.25–1.20 W/m <sup>2</sup> (340 nm)<br>0.70–2.80 W/m <sup>2</sup> (420 nm) | 30–135 W/m <sup>2</sup> (300–400 nm)<br>0.25–1.20 W/m <sup>2</sup> (340 nm)<br>0.70–2.80 W/m <sup>2</sup> (420 nm) |
| Light Monitor  | On-rack XENOSENSIV®   | SUNSENSIV®  | SUNSENSIV®   | Smart Light™ Monitor   | Smart Light™ Monitor   |
| Humidity Control (RH)  | N/A   | Automatic   | N/A  | Automatic  | Automatic  |
| Humidity Range with chiller OFF  | N/A   | Light Cycle: 10–70% (Dependent on Temp)<br>Dark Cycle: Up to 100%   | N/A  | Light Cycle: 10–75% (Dependent on Temp)<br>Dark Cycle: Up to 100%  | Light Cycle: 10–75% (Dependent on Temp)<br>Dark Cycle: Up to 100%  |
| Temperature Control (CHT)  | Automatic   | Automatic   | Automatic  | Automatic  | Automatic  |
| CHT Range  | 15°* to 70° C (*with chiller)   | 15°* to 70° C (*with chiller)   | 10°* to 40° C (*with chiller)  | 15°* to 70° C (*with chiller)  | 15°* to 70° C (*with chiller)  |
| Black Panel or Black Standard Temperature Range                          | BST 25°* to 130° C (*with chiller)<br>BPT 25°* to 95° C (*with chiller)   | BST 25°* to 100° C<br>BPT 25°* to 95° C (*with chiller)   | BST 25°* to 100° C<br>BPT 25°* to 95° C (*with chiller)                                    | BST 25°* to 120° C<br>BPT 25°* to 110° C (*with chiller)   | BST 25°* to 120° C<br>BPT 25°* to 110° C (*with chiller)   |
| Simultaneous BST and CHT control   | Standard  | Standard  | N/A  | Standard   | Standard   |
| Specimen Rack Type   | Bottle Rack (up to 15) or Packagings Rack (up to 22)  | Flatbed   | Flatbed  | Rotating Rack (Custom applications available; Capacity depends on specimen size)                                   | Rotating Rack (Custom applications available; Capacity depends on specimen size)                                   |
| Total Exposure Area  | 4000 cm <sup>2</sup>  | 3000 cm <sup>2</sup> (79 cm × 39 cm)  | 1100 cm <sup>2</sup> (39 cm × 30 cm)   | 6500 cm <sup>2</sup>   | 11000 cm <sup>2</sup>  |
| TFT full color touch screen control panel display of all test parameters | 5.7"  | 5.7"  | 5.7"   | 12"  | 12"  |
| Multiple languages (Asian and European)                                  | Standard  | Standard  | Standard   | Standard   | Standard   |
| Automatic test time count-down in kJ/m <sup>2</sup>                      | Standard  | Standard  | Standard   | Standard   | Standard   |
| Data acquisition via interfaces  | RS232 or Memory Card  | RS232 or Memory Card  | RS232 or Memory Card   | RS232, USB, or Memory Card   | RS232, USB, or Memory Card   |
| Online programming and monitoring via Ethernet                           | optional Add-ons  | optional Add-ons  | optional Add-ons   | optional Add-ons   | optional Add-ons   |
| Electric   | 400 V, 50/60 Hz (3, N, PE)<br>AC CEE (32 A, 5 pole 6h)<br>other configurations on request   | 400 V, 50/60 Hz (3P, N, PE)<br>AC CEE (32 A, 3 pole 6h)<br>other configurations on request                          | 200–240 V, 50/60 Hz (1, N, PE)<br>CEE (32 A, 3 pole 6h)<br>other configurations on request | 200–250 V, 3 Phase, 3 Wire, 50/60 Hz, 52 A; or 340–415 V, 3 Phase, 4 Wire, 50/60 Hz, 47 A                          | 440–480 V, 3 Phase, 3 Wire, 50/60 Hz, 60 A; or 340–415 V, 3 Phase, 4 Wire, 50/60 Hz, 63 A                          |
| Physical Dimension (W × D × H)   | 90 cm × 200 cm × 228 cm   | 90 cm × 91 cm × 172 cm  | 90 cm × 54 cm × 62 cm  | 127 cm × 102 cm × 198 cm   | 160 cm × 127 cm × 198 cm   |
| Floor Weight   | 390 kg  | 280 kg  | 90 kg  | 586 kg   | 807 kg   |



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