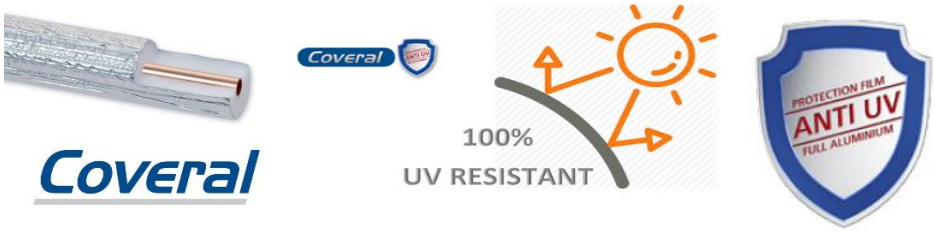

UV Exposures

UVA-340 Lamp Test Results

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Samples of different polymers were exposed in Florida, Arizona and Ohio for two years. The same samples were exposed in a laboratory weathering chamber using two irradiance levels and two moisture cycles.

A series of 15 different plastics and coatings were exposed to outdoor weathering in three locations and to accelerated laboratory weathering in a Fluorescent UV and Condensation Device. There were three different accelerated exposure cycles.

TABLE 1 -- Materials Tested

Polymer	Description	Color	Thickness (mm)
PVC	film	clear	0.2
Vinyl	glossy film	blue	0.1
Polystyrene	plaque	clear	2.8
Vinyl	film	green	0.1
Epoxy	coil coating	gray	-
Urethane	coil coating	gray	-
?	Automotive paint	blue	-
Polyester	coil coating	tan	-
Acrylic	sheet	clear	3.2
Polycarbonate	sheet	clear	3.2
Polyethylene	sheet	white	3.2
ABS	sheet	white	3.2
CAB	sheet	clear	3.2
Polypropylene	sheet	natural	4.7
Nylon	sheet	natural	4.7

Outdoor Exposures.

Miami, Florida was chosen for the subtropical exposure because it has high intensity sunlight, high annual UV, high year-round temperatures, high annual rainfall and high humidity. Because these Florida weather conditions are often considered something of a "worst case," Florida is often used as a benchmark location for outdoor weatherability testing.

Phoenix, Arizona was chosen for the desert exposure because it too is considered a benchmark location due to high annual UV and high year-round temperatures.

Cleveland, Ohio was chosen as the northern industrial exposure site because it is a north- ern US industrial city with a typical mixed industrial manufacturing environment.

Accelerated Exposures.

All of the laboratory exposures were performed in conformance with ASTM G53. The lamps were UVA-340 lamps with a peak at 343 nm and a cut-on at 295 nm.

Specimens exposed outdoors were measured after exposures of 12 months and 24 months. Specimens exposed in the 653 devices were measured at various intervals, depending on the material.

PVC Film, Polystyrene, Epoxy, Urethane, Polyester, ABS, Polypropylene. This material was a clear unstabilized film.

Natural Weathering Results The material changed very little after two years in Ohio and Florida. In Arizona, the material turned slightly yellow after one year, and brown after two years. The rate of yellowing in Arizona was slow during the first year and fast during the second year.

Accelerated Weathering Results The material changed very little after 2000 hours in a G53 device with a 4 hour UV / 4 hour moisture cycle, regardless of irradiance level. The material began to turn yellow after 1000 hours, and brown after 2000 hours, in a 653 device with continuous WV at an irradiance level of 1.35 W/m2.

Conclusions Using UVA-340 lamps, the 653 tester produced degradation consistent with that seen outdoors in all 15 of the materials tested. To obtain this high level of agreement the exposure cycle must include moisture. The degradation from the lab exposures averaged about 1000 hours to 1 year outdoors (9: 1 acceleration).