

High-irradiance laboratory weathering testing of plastics

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Accelerated laboratory weathering testing is used to evaluate the effects of sunlight, heat, and water on materials exposed to outdoor environments. These forces of weathering are delivered at higher rates in laboratory instruments relative to the natural environment, to produce degradation faster than outdoors. Acceleration is only possible up to a certain extent, after which laboratory phenomena may not match outdoor results. However, for some light-induced behavior acceleration may be possible using irradiance levels higher than those typically used in laboratory testing.

This work compares results from several high-irradiance accelerated test protocols, including natural sunlight concentrators, xenon arc instruments, and UV fluorescent apparatus. Testing in UV fluorescent apparatus at very high “3-sun” type irradiances, as well as xenon arc testing at irradiance values 50% higher than in common test standards. Test results are presented for color change and gloss loss of a variety of plastic specimens including polystyrene, ASA, PA6 nylon, and PBT. Results indicate that good rank-order correlation in color change can be achieved between outdoor and high-irradiance laboratory testing, for some polymers. The chemistry, coloring, and failure modes of the materials all influence how well the accelerated and natural outdoor data sets correlate.