

## Eastman copolyesters Effect of outdoor exposure

Like many plastics, Eastman copolyesters are sensitive to outdoor exposure. Long-term exposure to ultraviolet (UV) rays in sunlight can adversely affect performance of these copolyesters in the following ways.

- Color—shift to yellow
- Durability—decrease in impact resistance
- Transparency—increase in haze

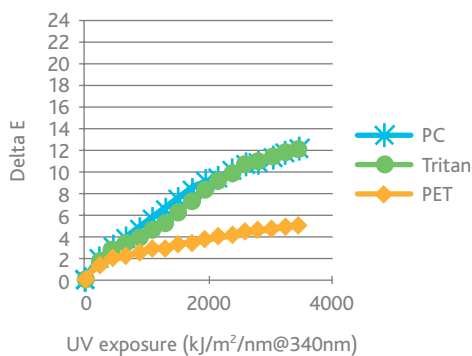
Because prolonged outdoor exposure to direct sunlight can reduce the lifetime of an application, Eastman copolyesters are not recommended for continuous outdoor use unless protected from UV light. Similar to other plastics (including polycarbonate), this UV protection typically involves the addition of a UV inhibitor to the formulation or a UV cap layer.

The following charts show the effect of UV sunlight on PET, polycarbonate, and Eastman Tritan™ copolyester. These data were obtained on specimens cut from extruded sheet and tested on Atlas Ci65A xenon arc accelerated weathering

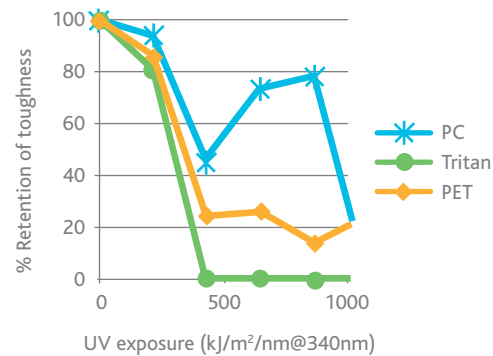
machines according to ASTM Practice G155 cycle 1 and ASTM D2565 using borosilicate inner and outer filters. Samples were removed periodically and tested for Delta E color difference (ASTM D2244) and impact strength (ASTM D6395). The “% retention of toughness” was calculated as the impact strength of the exposed sample divided by the impact strength of the unexposed sample.

Note that these machines are designed to greatly accelerate the effect of UV exposure, which is why the properties shown here change very rapidly. Each 500 kJ/m<sup>2</sup>/nm@340nm of machine exposure might be roughly equivalent to 5–30 weeks of actual outdoor exposure, depending on many factors, including time of year, degree of sunshine, global location, and conditions of use.

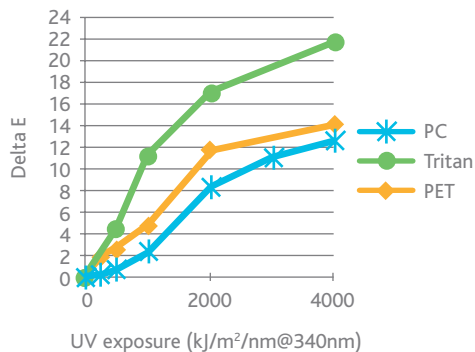
Effect of UV exposure on Delta E of extrusion blow molded bottles



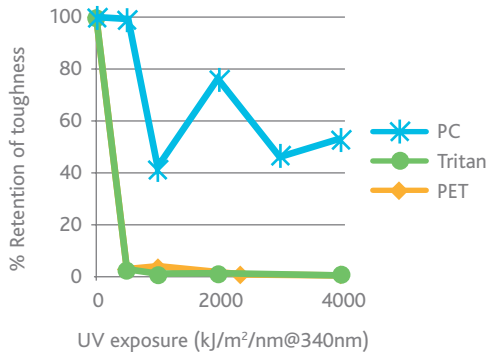
Effect of UV exposure on retention of toughness of extrusion blow molded bottles



**Effect of UV exposure on Delta E of extruded sheet**



**Effect of UV exposure on retention of toughness of extruded sheet**



The impact of prolonged UV exposure will vary by individual application, with product design, gauge, and durability expectations being variables to consider. Eastman does not know this weathering testing represents conditions for all applications, so perform necessary testing to ensure acceptable performance over the life of the applications.

UV inhibitors can be used to improve the weathering performance of Eastman Tritan™ copolyester, however testing

is needed to determine the correct inhibitor and loading level needed to meet the fitness-for-use requirements of an application. In addition, UV resistant coatings or cap layers are also available for copolyesters used in outdoor signs and other film and sheet applications. As with any application, the fitness-for-use requirement must be evaluated in each case to ensure success. Contact an Eastman representative if you have any questions.

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