

Product advisory

marketing

UV-stability of polymers

It is well known that plastics in general and polyolefins in case of synthetic turf are sensitive to degradation when exposed to sunlight. This degradation is called photo-degradation. Photo-degradation is a process that generally results in breaking down the polymer chains in the polymer/product. Unless stabilizers are added to the polymer this circular chain reaction accelerates. Ultimately photo-degradation causes cracking, chalking, color changes and loss in physical properties.

In particular, the non-visible UV radiation in sunlight is responsible for photo-degradations of polymers. The UV radiation is characterized by its short wavelengths and makes up less than 5% of sunlight. The solar UV radiation spectrum is divided into three categories UVA, UVB and UVC. The UV radiation that reaches the earth's surface is for more than 98% UVA, because of absorption in the atmosphere's ozone layer of UVB and UVC. Although UVC is completely absorbed, a small part of UVB reaches the earth's surface. This small portion of UVB radiation is compared to UVA very aggressive towards photo-degradation, because of its very short wavelengths.

In order to test the UV stability of polymers outdoor exposure to natural weathering is a very realistic, but a very time consuming method. Several weathering test methods have been developed using artificial light sources to provide accelerated test procedures. These test methods are used to predict the UV stability of a product over a number of years. In general there are three types of artificial weathering light sources available for accelerated weathering tests: UVA, UVB and Xenon. The relationship between the spectrum of these light sources and sunlight can be found in the next table.

Light Source	Realism compared to sunlight
UVA	Reasonable match of solar spectrum in UV region, but not for the long wavelengths (visible and infrared)
UVB	Shorter wavelengths compared to UVA. The spectrum of this light source also contains short wavelengths that are not present in solar radiation on the earth's surface. These wavelengths are very aggressive towards polymers.
Xenon	Xenon lights provide the best simulation of sunlight. If proper applied the radiation can match sunlight closely.

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