

Product advisory

marketing

Discolouring of polyethylene - gas fading

The discolouring of polyethylene is a phenomenon that is well-known in polymer industry. It is also described as yellowing, pinking or gas fading. The colour changes of the material are generally a result of auto-oxidation of phenolic antioxidants in the basic polymer used. These phenolic antioxidants are added to the resin by the producer to protect and stabilize the polymer during processing and use. The change in colour of the polymer is strictly cosmetic and does not affect physical properties.

The sources of discoloration in polyethylene are diverse and can vary from packaging to inappropriate material composition. The most relevant source is excessive levels of atmospheric pollutants like nitrogen oxides (NO_x). The relatively high levels of NO_x are usually caused by exhaust gasses (gas fading), for example fork lift trucks and heaters in warehouses.

The chemical reaction between atmospheric NO_x, even in low concentrations, and phenolic antioxidants in the polymer triggers discolorations ranging from yellow to red depending on the polymer composition. The severity of the discoloration increases with increasing exposure to NO_x and increasing concentration of phenolic antioxidants in the polymer.

Other parameters influencing the severity of discolouration are the use of Titanium dioxide (TiO₂, used as white pigment) and the use of basic (high pH) additives. The chemical reaction is reversible and can be eliminated with changes in the environmental conditions. To reverse and remove the discolorations expose the material to UV-light (sunlight).

These reactions can occur in polymers in any form, like pellets, moulded parts, film and yarn. Pinking is especially visible in white products, because of the colour and the use of TiO₂ as pigment. As mentioned above the pinking can be reversed by exposing the product to UV-light.

With respect to synthetic turf blades, the pinking of white yarn will disappear after installation of an outside pitch. When using synthetic turf for an inside application, exposure to sunlight before installation will remove the pinking and after installation the exposure to exhaust gasses should be minimized.

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