LIGHTFASTNESS

Same as all materials, plastics are exposed to external stresses during their service life. These include mechanical stress (tension, pressure, shearing) as well as biological (bacteria, fungi), chemical (oils, surfactants, air pollutants) or natural influences (air, humidity) as well as exposure to light and temperature changes. These external stress factors have a varying impact on the durability of the material. Visible or chemical changes as well as changes in the technical characteristics may occur[1].

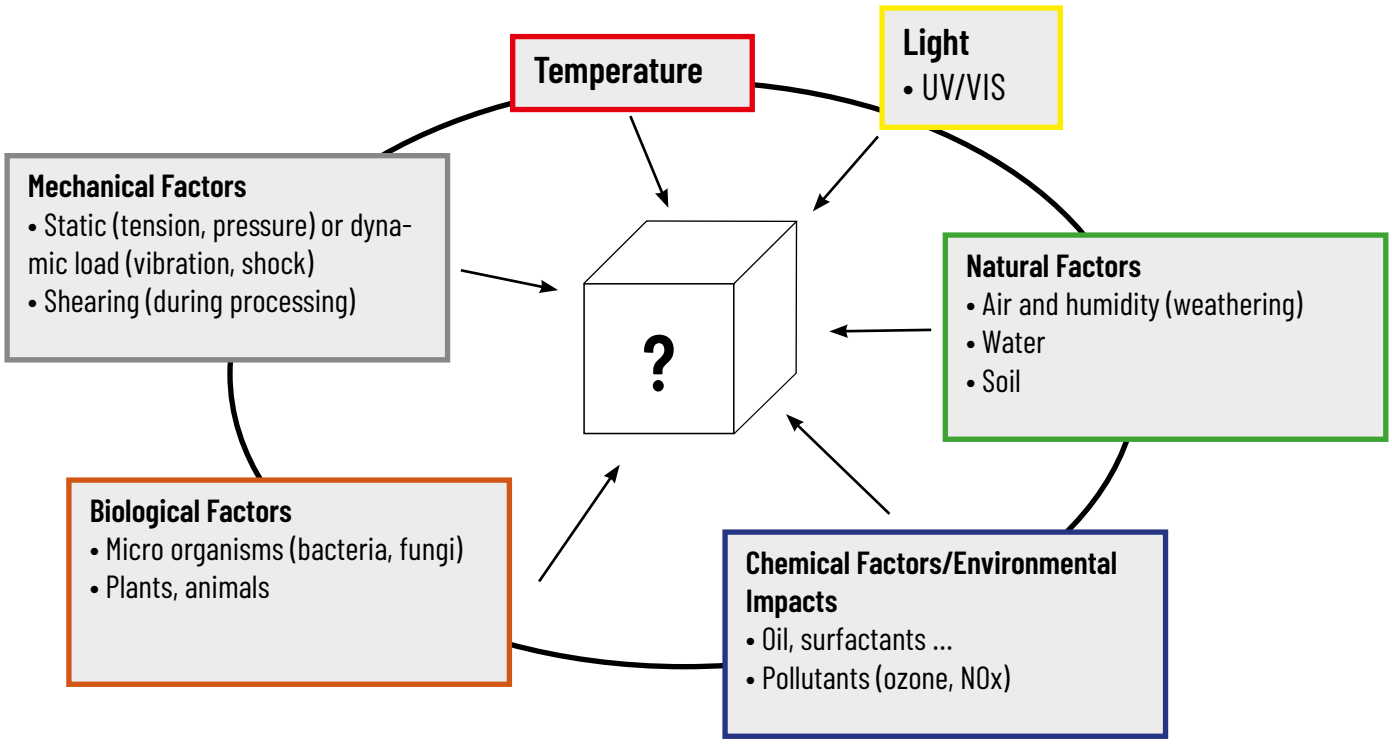

Figure: Stress factors on polymer materials, source: Prof. Dr. Samuel Affolter, Langzeitverhalten von Thermoplasten (Engl.: Long-term effects of thermoplastics), Interstaatliche Hochschule für Technik, Buchs, Switzerland, Fig. 1, page 3

Which impact does light have on the durability of plastics?

Light sources with a high UV proportion can have a corrosive impact on many materials. Examples for this effect are faded wood and leather, paled fabric or a sunburn. The same effect that can be seen in wood, leather and fabric under the influence of light causes changes in plastic as well. This process is called „photooxidative ageing". The higher the UV exposure - e.g. from direct sunlight -, the faster the material can change. Many factors like the radiation source and radiation intensity of the light, the temperature, air humidity, oxygen partial pressure, industrial pollutants and material-specific factors (composition of materials) play an important role in these complex processes.

What is lightfastness?

Lightfastness is the material's optical and physical resistance to UV radiation. The smaller the measured lightfastness, the quicker and stronger colour changes occur. Lightfastness thus describes the material's resistance against colour changes caused by light rays. With the so-called „Blue Wool Scale" [2], the level of lightfastness can be measured.

How do you determine the lightfastness of plastics?
The weather and light resistance of plastics is rated according to the Blue Wool Scale, under laboratory conditions. The measuring procedure includes a comparison with a scale of eight standardised wool strips with different levels of lightfastness, which are exposed to light together with the sample. Level 1 means a very high deviation in the colours before and after exposure, i.e. very little lightfastness. Level 8 means an excellent colour stability. The lightfastness which is then determined is the level where you can see a specified divergence to the unexposed sample. Simply put, with each level it takes twice as many hours as in the level until the colours start to fade.

Which factors have an influence on the lightfastness?
As was mentioned before, light resistance and material ageing are influenced by a number of additional factors:

- Atmospheric stresses
- Source of radiation and the light's radiation intensity
- Temperature
- Chemical stresses
- Biological stresses
- Mechanical stresses

Why is it not possible to precisely specify the lightfastness of edgings beforehand?
In order to make exact predictions on a material's light resistance, all factors that influence the lightfastness have to be taken into consideration and measured in accelerated tests. Since the actual conditions in everyday use of the processed edgings differ significantly and the influencing factors cannot be foreseen, the edgings' ageing process cannot be defined clearly in terms of a specified time period. Additionally, the colour of the edgings plays a roll in the ageing process.

Where can you look up the lightfastness rating of plastic edgings?
The lightfastness rating according to the Blue Wool Scale is stated in the technical data sheets of the respective edgings. Yet, this rating refers to the specific type of plastic in general and not exclusively to the area of furniture edgings.

Which is the average lightfastness of ABS edgings?
On average, ABS edgings have a lightfastness level >6 according to the Blue Wool Scale.

Are there differences in ABS edgings regarding their lightfastness?
In general, white and pastel shades become visibly yellow rather quickly compared to other colours. Darker tones, in particular black, are usually more resistant to the influence of light.

Summary
There is no such thing as a full lightfastness. Every material is fading under the direct or indirect influence of UV radiation - some a little more than others. Plastic edgings are generally well stabilised against ageing under the influence of light, atmospheric oxygen and increased temperature. Moreover, they possess an excellent resistance to extreme fluctuations in temperature and humidity. According to DIN EN ISO 4892, ABS material has a lightfastness rated as >6. Due to the many variables (light, temperature, chemical, biological and mechanical stresses as well as colour of the edging), no exact predictions can be made on the lightfastness of a specific edging.

1 see: Prof. Dr. Samuel Affolter, Langzeitverhalten von Thermoplasten, Interstaatliche Hochschule für Technik, Buchs, Switzerland, p. 3, figure 1
2 DIN 53952 is no longer valid and was withdrawn.