

BRINGING LIFE  TO PLASTICS

PP- tapes



SKIN ISN'T THE ONLY THING
THAT NEEDS PROTECTING
FROM THE SUN



UV STABILIZATION OF PP-TAPES



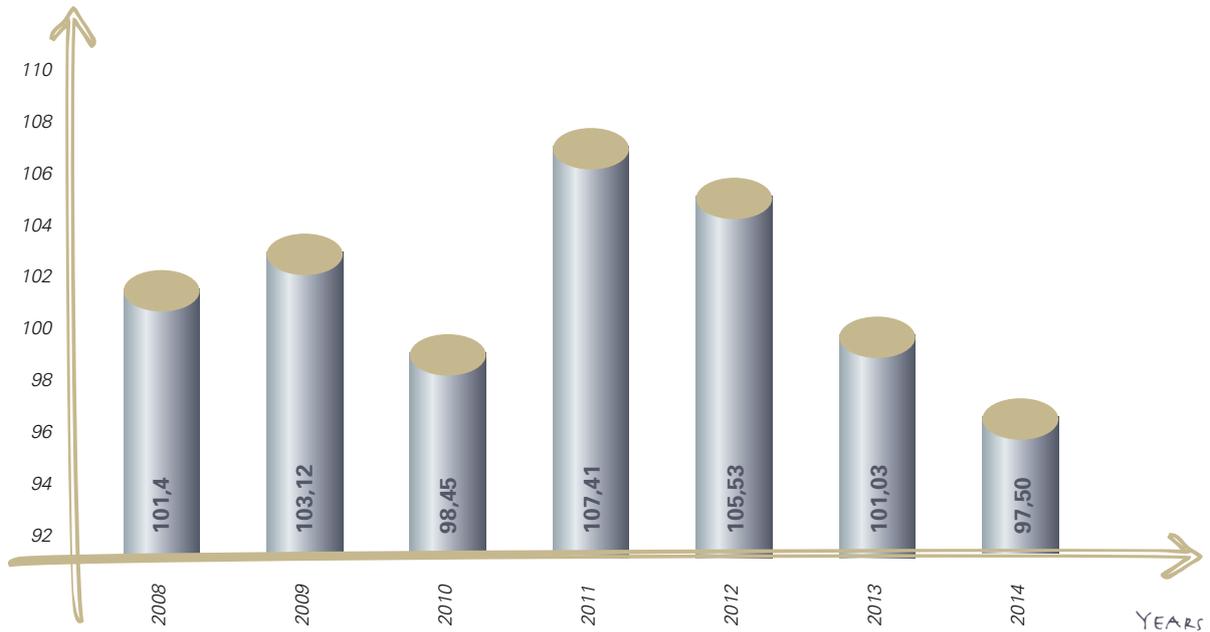
CONTENT

- _ Information about climate and how to design a UV stabilizer to natural weathering
- _ Deteriorating influences to a light stabilizer
- _ Artificial weathering methods for tapes
- _ Frequently used products from Gabriel-Chemie
- _ Influences of colours to a light stabilization

A good UV stabilization of a PP-tape should enable that after desired lifetime at least 50% of initial tensile strength is present at the woven fabric. It has to be taken into account that each UV stabilization must be designed regarding to maximum possible annual sun radiation energy which is typical to geographic area of application where the final product is applied. The solar radiation depends on climatic factors and can show absolutely different values according to geographic location of the exposure.



SUN RADIATION
ENERGY KLY



Quellenangabe: ZAMG (Zentralanstalt für Meteorologie und Geodynamik), Wien

WHAT YOU NEED TO KNOW ABOUT CLIMATE

THE GRAPH ABOVE SHOWS AS AN EXAMPLE THE ALTERATION OF THE SUN RADIATION ENERGY IN VIENNA/AUSTRIA RELATING TO THE YEARLY MEASUREMENT:

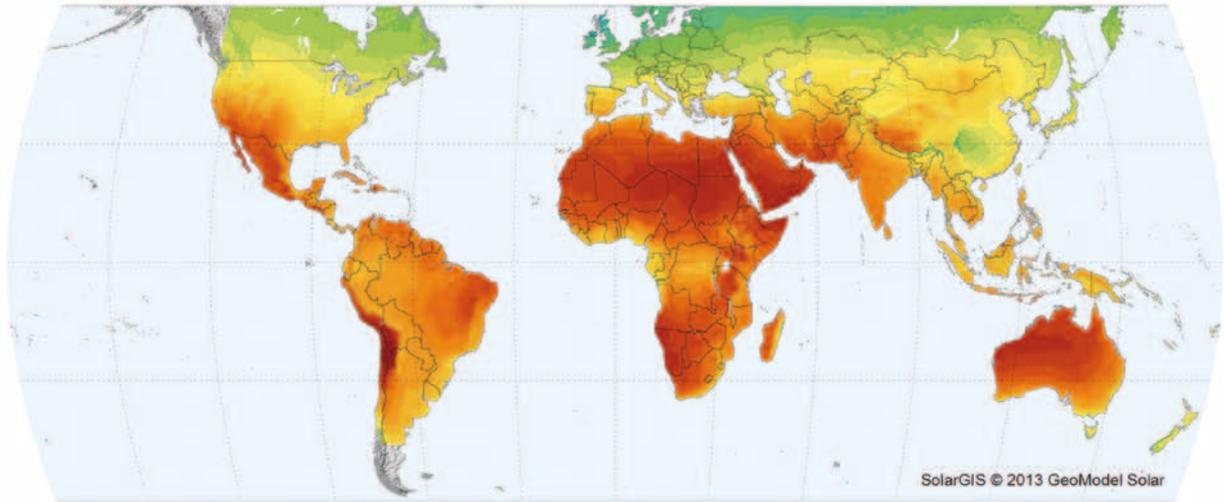


In the past, the yearly sun radiation energy in Central Europe was assumed with an average of 80 kLy per year. Latest measurements of the Austrian Central Meteorological Institute show that the trend of the sun radiation energy has risen due to climatic alterations.

The trend of the sun radiation energy in Austria recorded from 1981 to 2009 has risen due to climatic alterations to an annual average of approximately 100 kLy in Austria, even in some areas about 110 kLy. In 2003 Austria had the highest recorded kLy/yr since records began. In Vienna was recorded approx. 118 kLy/year, some areas of Austria achieved 125 kLy/year.

Therefore, it is of determining importance to design a light stabilizer for PP tapes according to the geographical area where the final article is applied.

WORLD MAP OF GLOBAL IRRADIATION



Long-term average of: Annual sum 60 75-80 95 110-115 130 145 160-165 180 200 215 230



GLOBAL RADIATION

Our product recommendations are based upon solar radiation according to place of the exposure in form of kLy/year - units. Reductive chemical influences, coming from atmosphere or from contact with chemicals, adding of deteriorating colours or additives to the polymer – intended or not, must be considered at our product recommendations and requires particular testing.

THE FOLLOWING SUN RADIATION ENERGY VALUES CAN BE CONSIDERED AS USUAL

The sun radiation energy is usually expressed in kLy (Kilolangely) units. A conversion to other energy units is possible, the conversion into other units can be done as follows:

1 kLy = 1000 Ly (Langely)

1 kLy = 4187,5 J/cm² = 4,19 kJ/cm²

1 kLy = 1,11632 Wh/cm² = 11,63 kWh/m²

| AREA | KLY |
|-----------------|---------|
| Scandinavia | 60-80 |
| Central Europe | 100-120 |
| Southern Europe | 120-160 |
| Northern Africa | 160-180 |
| Russia North | 80 |
| Russia South | 140 |
| Australia | 180-200 |

WHICH INFLUENCES CAN DETERIORATE THE UV STABILIZATION OF PP-TAPES

SERVICE LIFE OF UV-STABILIZED PP-TAPES IS INFLUENCED SIGNIFICANTLY from the quality of the polymer (or polymer blends) to be stabilized. Once selected, polymers should not be changed. New polymers should be carefully evaluated by tests, if they can deteriorate the light stabilization – same procedure is recommended if new additives are taken.

NEXT TO OTHER CRITERIA'S ESPECIALLY THE WALL-THICKNESS OF THE TAPES to be stabilized is a decisive matter to design a UV stabilizer. Extreme weakening of the wall-thickness through extreme stretching leads to significant shortening of the service life expectation of the tapes.

PIGMENTATION CAN IMPROVE OR DETERIORATE THE UV-STABILITY of a UV-stabilized polymer. In our combination products Colour/UV-Stabilizer we only use compatible pigments which have proven their performance due to long-standing experiences.

SOME CONTACT MEDIA (for example agro-chemicals) can decrease the UV-performance of tapes. In particular sulphur-containing additives and acid splitting halogen-containing flame-retardants also critical packaging-contents with direct contact to tapes can lead to a considerable deterioration of the UV stabilization.

WORST CUTTING QUALITY OF TAPES BY USE OF BLADES having too much abrasive wear will cause during exposure oxidation and degradation to the polymer at outdoor exposure and adds raised vulnerability to the tapes. This further can deteriorate a good light stabilization.

CALCIUM CARBONATE (CaCO₃) IS FREQUENTLY USED IN MASTERBATCH as an Antisplit additive at production of PP tapes offering better weaving properties. It must be taken into consideration that specific impurities in some CaCO₃ grades will cause a considerable deterioration of a UV stabilization. Selection of a CaCO₃-masterbatch with a high purity CaCO₃ grade as used in our MAXITHEN® PP7A7120ASP Antisplit MB is very important.

IT HAS TO BE CONSIDERED THAT DARK COLOURS will absorb more thermal energy during outdoor exposure, which leads to speed up the heat ageing process of the polymer itself, in cases of such colours a higher light stabilizer addition may be necessary.

WHICH WEATHERING METHODS ARE USUAL FOR THE TAPE INDUSTRY:

NATURAL WEATHERING ...

... is carried out in the tape industry rather seldom since the time of exposure for test runs according to requirement can be sometimes very long.

ARTIFICIAL WEATHERING

Following methods are usual in the tape industry:

- _ ASTM G 53: "Standard Practice for operating of Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of non metallic materials".
- _ Beside others, following exposure conditions as wet/dry cycles are taken most often at this normative standard:
 - _ 8 hours illumination with 60°C black panel temperature (b.p.t.)
 - _ 4 hours condensation (without illumination) with 50°C b.p.t.
 - _ Ultraviolet lamp: UV-B 313

European Standard EN 277: "Bags for the transportation of foods for the food aid-bags of polypropylene woven fabric" here is referred onto the ASTM G 53, at what an illumination is prescribed by 144 hours under above stated conditions.

It should be noted that a direct correlation between a natural and an artificial weathering cannot be construed (particularly if UV-B fluorescent lamps are in use).

The reason for that can be found at the very different energy distribution spectra of natural and artificial light sources.





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LIGHT STABILIZER MASTERBATCHES FOR NATURAL WEATHERING CONDITIONS

FREQUENTLY USED PRODUCTS FROM GABRIEL-CHEMIE FOR UV STABILIZATION OF PP-TAPES:

PP7AA1570UV

For non food applications. This standard product is used in cases where no direct contact of food together with the PP-tapes must be expected.

PP73450UVAO

For non food contact applications. This standard product is used in cases where no direct contact of food together with the PP-tapes must be expected. This

product is a combination of PP7AA1570UV and PP73450UVAO products in combination with an antioxidant package ensuring excellent processing and recycling properties, also suitable for high tensile tapes.

PP74340UV

For non food contact applications. This product is used in cases where no direct contact of food together with the PP-

tapes must be expected. This product is a special product and a higher concentrated version of the upper product MAXITHEN® PP73450UVAO without antioxidant.

PP79870/20UV

For direct food contact applications. This standard product is used especially in cases where direct contact with the food together must be expected.

PP72210UVAO

For non food contact applications. This product is used in cases where no direct contact of food together with the PP-tapes must be expected. This product is a special product and a higher concentrated version of the upper product MAXITHEN® PP73450UVAO with antioxidant.

PP72200UV

For food contact appli-

cations. This product is used especially in cases where direct contact with the food together with the PP-tapes must be expected.

PP79570/20UV

For food contact applications. This product is used especially in cases where direct contact with the food together with the PP-tapes must be expected.



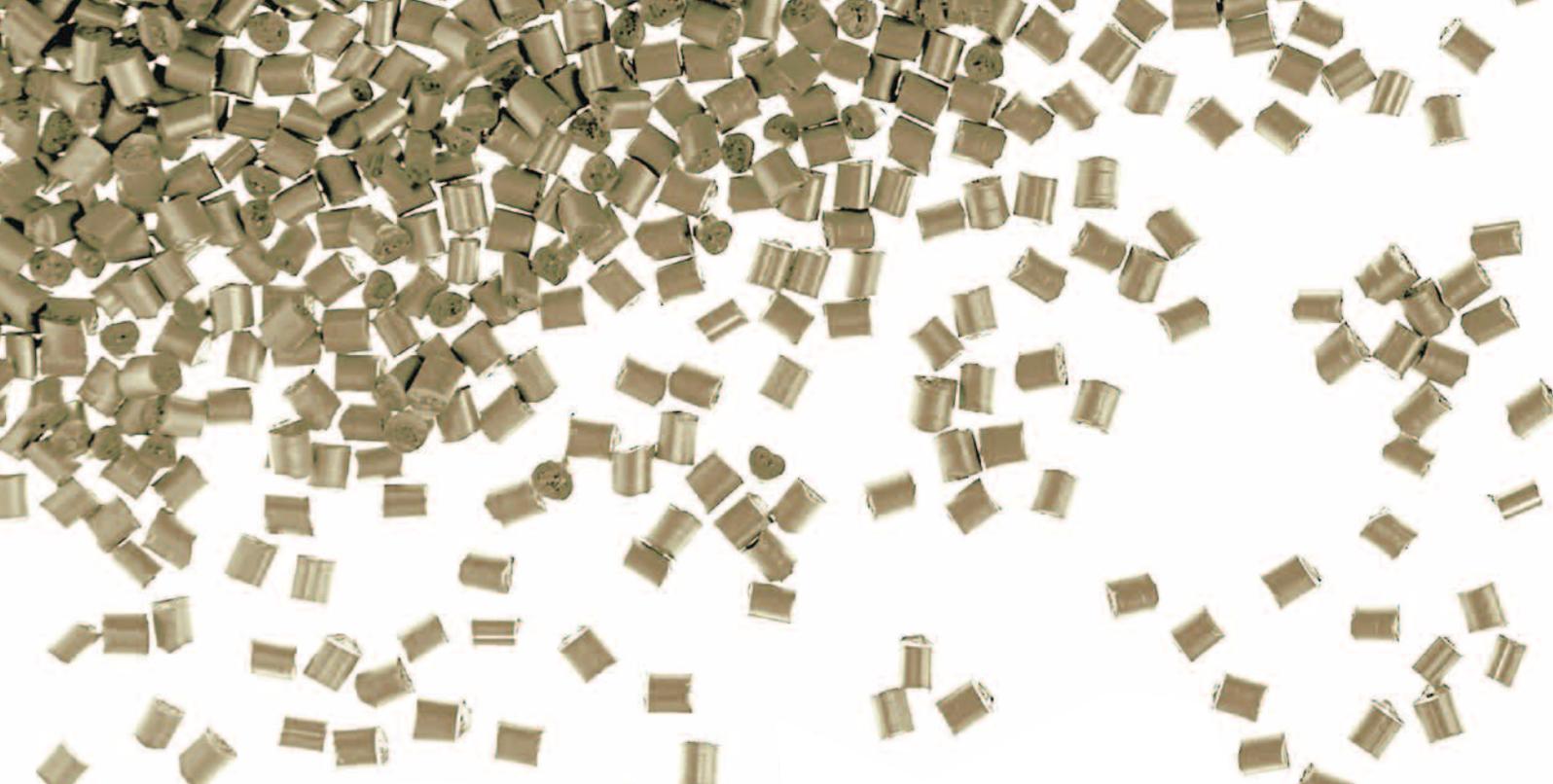
LIGHT STABILIZER MB FOR UV SPECIFICATIONS RELATED TO QUV ARTIFICIAL WEATHERING

Accelerated weathering with UVB-313 lamps is known to be absolutely apart from any natural weathering or artificial weathering with Xenon lamps. The lamp emission maximum is at 313 nanometre wavelength, which is photo chemically degrading the polypropylene itself, because 313 nanometre is a critical wavelength to this polymer. The progress of deteriorating photo degradation to the PP caused by the UVB313 test method is faster than the UV Stabilizer can compensate radicals, formed from the polymer degradation during the test.

Combinations masterbatch HALS/UV Barrier are seen to be as a possible solution to stand UVB-313 test methods, for a test duration of 200 hours. The job of the UV-Barrier is to transform the UVB-313 light energy into thermal energy only, at which the UV stabilizer would have more time to work against consequential thermal decomposition.

MAXITHEN® HP HP7A2160UV is a combination masterbatch HALS/UV-Barrier. This product is recommended to be used in order to fulfil 200 hours accelerated weathering test with UVB-313 lamps. The dosage should be evaluated between 2-3%.

MAXITHEN® HP HP7A3130UV is a combination masterbatch HALS/UV-Barrier. This product contains a higher concentration of HALS stabilizer in combination with UV Barrier and is recommended for application where natural weathering and accelerated weathering conditions must be fulfilled. The dosage should be evaluated between 2-3%.



FURTHER ADDITIVE SUITABLE FOR PRO OF PP-TAPES

ANTISPLIT MASTERBATCHES AND THEIR INFLUENCES TO A LIGHT STABILIZATION.

MAXITHEN® PP7A7120ASP

This product contains 80% CaCO_3 (Calcium Carbonate) on polypropylene carrier.

In combination with light stabilizers, Antisplit agents may deteriorate the efficiency of UV-stabilizers especially when products based on lower quality Calcium Carbonate (CaCO_3) as mineral fillers are used. Calcium Carbonate is gained from natural sources and can contain impurities capable to deteriorate catalytic a light stabilization.

In order to reduce the interactions with light stabilizers to a minimum, we recommend the use of our product MAXITHEN® PP7A7120ASP which is based on carefully selected Calcium Carbonate and therefore recommended for those applications.

Addition rate of 1% is recommended to get sufficient Antisplit and weaving properties for PP-tapes.



MASTERBATCHES DUCTION

ANTISTATIC MASTERBATCH FOR PP-TAPES

MAXITHEN® PP701310AS is a heat resistant, physiologically safe, internal antistatic masterbatch.

This product is used to make PP films and tapes antistatic. The dosage should be evaluated between 1-4%. The antistatic effect usually occurs shortly after processing, due to the fast migration. The maximum surface resistance that can be reached with internal antistatics is approximately 109 Ohm. Further technical details are in our technical data sheets.

PERMANENT ANTISTATIC MASTER- BATCH FOR PP TAPES

UNIMAX® UNS7A4420AS

This product can be used to make polypropylene tapes used for production of PP woven fabric without and with coating permanently antistatic.

Dosage recommendations are given upon request, please contact our sales and/or technical department.

MAXITHEN® HP7AA5370AS

This product is used for creating permanent antistatic surfaces on PP woven fabric, FIBC/Octabin liners. Depending on the surface resistance of the polymer, around 1010 Ohm/sq can be achieved. Dosage recommendations are given upon request, please contact our sales and/or technical department.

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