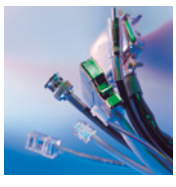
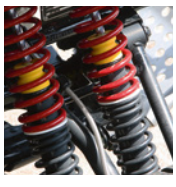
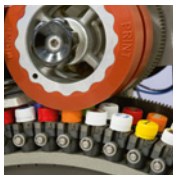
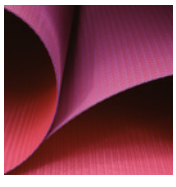
QUALITY PERFORMS.

Versatile hydrolysis stabilization

Stabaxol®

QUALITY WORKS.

LANXESS
Energizing Chemistry

THE SOLUTION TO HYDROLYSIS PROBLEMS

Highly effective hydrolysis stabilization

Stabilizers, which extend the service life of plastics and polyurethanes, are often the key components that enable the use of these materials in critical applications.

The problem

Products that are produced by polycondensation or contain polycondensation products generally display a weakness when attacked by water or moisture, particularly at elevated temperatures. The degradation or breakdown of polymers by water and acids is known as hydrolysis.

In hydrolysis, the ester molecule of the polymer is cleaved by the action of water to produce a carboxylic acid and an alcohol. Once initiated, this process accelerates autocatalytically and, in the absence of Stabaxol®, results in complete breakdown.

$$R_1OOC\text{-}R_2\text{-}COOR_3 + H_2O \xrightarrow{H^+} R_1OOC\text{-}R_2\text{-}COOH + R_3\text{-}OH$$

The solution

Stabaxol® has a worldwide reputation as the most effective antihydrolysis agent for many polymers, including PU, PET, PBT, TPU, TPE-E and EVA.

Polymers containing Stabaxol® usually show a threefold increase in service life. When Stabaxol® reacts with the cleaved products, carboxylic acid or water, it creates urea compounds that have no negative impact on the stabilized material.

Reaction with acid

ENHANCED MATERIAL QUALITY

Wide range of applications

The extended service life brought about by Stabaxol® provides a decisive competitive edge and opens up new applications in higher quality market segments. The following examples illustrate the effectiveness and versatility of Stabaxol® in PU, TPU, TPE-E and PET applications.

Stabaxol® in PU

Polyurethane elastomers are high-molecular-weight organic materials that are manufactured by the polyaddition process. Depending on the starting materials, a large variety of different polyurethane elastomers can be obtained.

They are used whenever a high degree of wear resistance is demanded. This property is required in particular in caterpillar treads for construction, forestry and agricultural machinery, in roll covers for the paper and printing industry, and also in wheels and rollers for the transport industry.

Thanks to their particular vibration-damping properties, polyester-based cellular PU elastomers are used as auxiliary suspension springs in virtually all kinds of vehicles. Stabaxol® is used to prevent premature failure of the auxiliary springs due to aging, thus increasing the service life of the complete suspension strut.

Stabaxol® is highly effective in improving the hydrolysis resistance of polyurethane-based adhesives. Stabilized hot-melt adhesives, for example, are used for the adhesive bonding of shoe soles, thereby reducing the risk of complaints arising from premature detachment of the outsole as a result of hydrolysis. Further applications include adhesives for seals.

Stabaxol® in TPU

Thermoplastic polyurethanes (TPU) are well-established as high-quality materials in the shoe industry. Hydrolysis resistance is required in particular for walking and safety shoes and for ski and snowboard boots.

Thanks to its liquid form, Stabaxol® P 200 can be easily incorporated into the polyol and provides long-lasting hydrolysis stabilization. Depending on processing conditions, Stabaxol® I LF, Stabaxol® P or Stabaxol® masterbatches may also be used.

ENHANCED
MATERIAL QUALITY

Stabaxol® in TPE-E

Thermoplastic polyester elastomers are elastomers that combine the flexibility of rubber with the strength of modern thermoplastics.

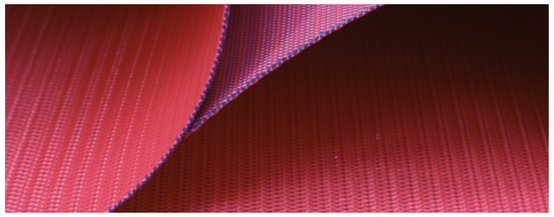
Thermoplastic ester elastomers are widely used in cable applications. Stabaxol® can offset their susceptibility to hydrolysis. Special Stabaxol® masterbatches have been developed for use in polyether/ester and polyester/ester copolymers.

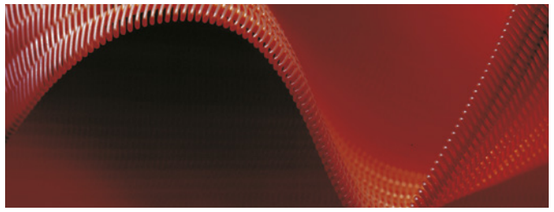
Stabaxol® in PET monofilaments

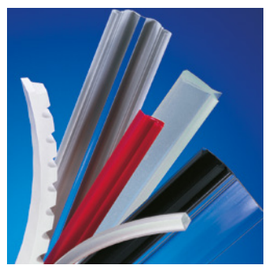
Drying screens made of woven plastic filaments needed for papermaking, which are used in aqueous media at temperatures of around 100 °C, are subject to hydrolytic degradation.

The PET monofilaments used for this purpose often do not completely meet the stringent hydrolysis stability requirements for such applications. Adding Stabaxol® to PET can counteract such degradation and improve the service life considerably compared to unstabilized grades.

In addition to the cost savings for the screens themselves, the distinct reduction in downtime and replacement time for screen changes also has a positive impact on operating costs.





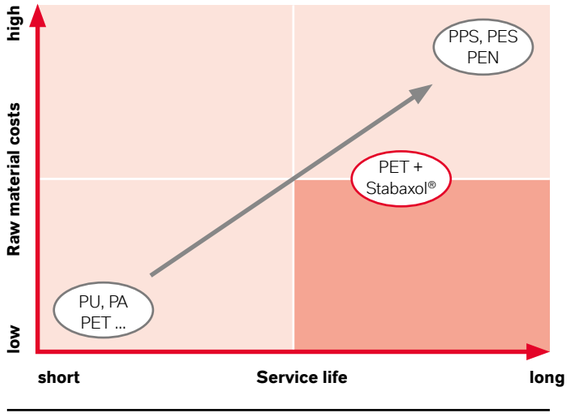


OPTIMIZING
ECONOMIC VIABILITY

Performance advantages add value

Using Stabaxol® improves the cost/benefit ratio in well-established applications. Considerable raw material-related cost advantages may also be achieved in applications that normally require more expensive materials (e.g. high-performance plastics such as PPS).

Cost/benefit ratio of using Stabaxol®

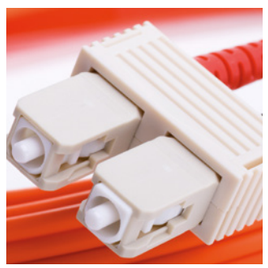


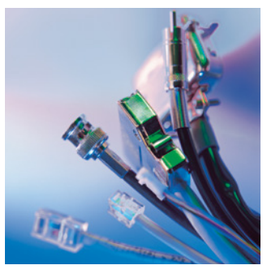
Expertise from the specialist

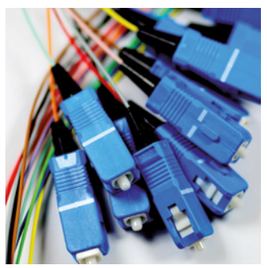
More than 30 years' experience

LANXESS' Stabaxol® product range has a leading position in the worldwide market for hydrolysis stabilization.

- A large range of quality products based on the most varied active ingredients and masterbatches
- Development of Stabaxol® masterbatches tailored to customer requirements
- Extensive processing know-how from years of experience producing masterbatches
- Analytical expertise to evaluate the use of Stabaxol® in customer applications
- Fully equipped laboratories in Germany the United States and China







APPLICATIONS OF STABAXOL®
OVERVIEW

The appropriate grade of Stabaxol® is determined by the target polymer and what is required of the finished product.

PET

Fibers, films, screens, filters

PBT

Sheathing for optical fibers, injection-molded articles for electrical/electronic applications

PA

Monofilaments, industrial injection moldings, tubes, containers

TPE-E

Cable sheathing, industrial injection moldings

TPU

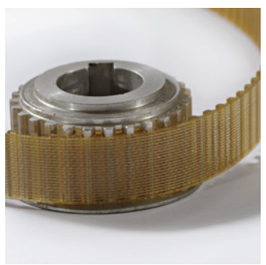
Cable sheathing (automotive), shoe systems, injection molding (electrical/electronic), sealings

PU

PU hot/cold casting systems (automotive auxiliary springs, Vulkollan® applications), ester flexible foam, rollers

PU Rubber

Rollers, drive belts, membranes, seals



VERSATILE HYDROLYSIS
STABILIZATION

Stabaxol® application

Product	Applications							
Active ingredients	**PET**	**PBT**	**PU**	**PA**	**PU rubber**	**TPU**	**TPE-E**	**EVA**
Stabaxol® I	□	□	■		■	■		□
Stabaxol® I LF	□	□	□		□	■		■
Stabaxol® P	■	■	■	■	■	■	■	■
Stabaxol® P 100	■	■		■	■	■	■	■
Stabaxol® P 200			■			■		■
Masterbatches (standard grades)								
Stabaxol® KE 7646	■							
Stabaxol® KE 8059	■							
Stabaxol® KE 9193		■						

□ possible use ■ recommended use Tailor-made solutions for custom-made masterbatches based on different polymer types are also available.

Stabaxol® description

Product	Chemical name	Appearance, supply form	Melting range in °C	Carbodiimide content	Dosage level
Active ingredients					
Stabaxol® I	Monomeric carbodiimide	Pale yellowish crystalline melt or powder	Approx. 45-50	min. 10%	Addition approx. 1 part by weight per 100 parts by weight polyester polyol; in TPU approx. 1.0-2.0 parts by weight during extrusion.
Stabaxol® I LF	Monomeric carbodiimide	Pale yellowish crystalline melt or powder	Approx. 45-50	min. 10%	Addition approx. 1 part by weight per 100 parts by weight polyester polyol; in TPU approx. 1.0-2.0 parts by weight during extrusion. Low fogging due to lower monomeric content
Stabaxol® P	Polymeric carbodiimide	Pale yellowish powder/pellets	Approx. 50-60	min. 13.0% (for pellets) min. 12.5% (for powder)	Addition approx. 0.5-2.5 parts by weight per 100 parts by weight of finished product
Stabaxol® P 100	High molecular weight polymeric carbodiimide	Pale yellowish powder/pellets	Approx. 75-85	min. 13.0%	Addition approx. 1.5-2.5 parts by weight per 100 parts by weight of finished product
Stabaxol® P 200	Polymeric carbodiimide	Viscous, yellowish liquid	Freezing point approx. 5	min. 6%	Addition approx. 1.0-4.0 parts by weight of Stabaxol® P 200 per 100 parts by weight of the polyol component of the PU system used
Masterbatches (standard grades)					
Stabaxol® KE 7646	Polymeric carbodiimide 15% in PET	Yellowish cylindrical granules	Approx. 260-275		Addition approx. 10-20 parts by weight per 100 parts by weight PET. This corresponds to an active ingredient content of approx. 1.5%-3% Stabaxol®
Stabaxol® KE 8059	Mixture of polymeric carbodiimides 15% in PET	Yellowish cylindrical granules	Approx. 260-275		Addition approx. 10-20 parts by weight per 100 parts by weight PET. This corresponds to an active ingredient content of approx. 1.5%-3% Stabaxol®
Stabaxol® KE 9193	Polymeric carbodiimide 15% in PBT	Yellowish cylindrical granules	Approx. 220-230		Addition approx. 10-20 parts by weight per 100 parts by weight PBT. This corresponds to an active ingredient content of approx. 1.5%-3% Stabaxol®

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