

ORTEGOL® AO 5

ORTEGOL® AO 5 is a liquid preparation, used as a highly efficient antioxidant in the manufacturing process of flexible polyether and polyester polyurethane foams.

The preparation ORTEGOL® AO 5 does not contain any BHT and has, compared to other antioxidants, a reduced amine content.

Physical properties

Appearance	slightly viscous, yellow liquid
Density (25 °C)	0.95 – 1.00 g/cm ³
Viscosity (25 °C)	approx. 800 – 1 200 mpas
Solubility	insoluble in water, soluble in polyols

Instructions for storage

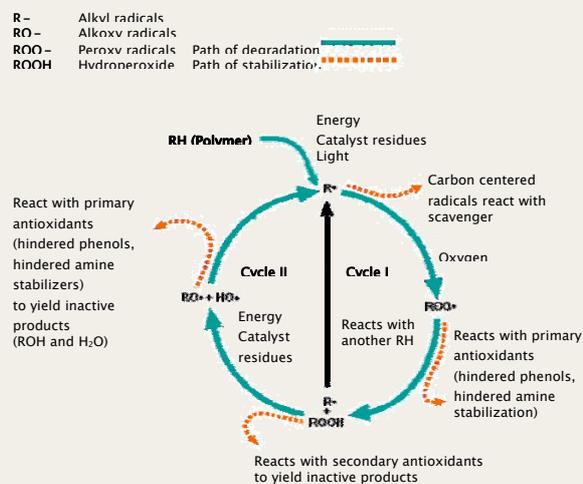
ORTEGOL® AO 5 has a maximum shelf-life of 12 months under the condition that it is stored in factory-packed containers and protected against extreme weather conditions, particularly against heat and moisture.

Storage at low temperatures does not cause problems, however, it is recommended to warm up undercooled material to about ambient room temperature before use.

Thermo-oxidative degradation

Polyurethane, like other organic materials, react with molecular oxygen in a process called "autoxidation." This degradation process results in product discoloration (scorch) and loss of physical properties. Autoxidation can be initiated by heat, high energy radiation (UV light), mechanical stress, catalyst residues, or through reaction with other impurities. Free radicals (Figure 1) are generated which react rapidly with oxygen to form peroxy radicals. These peroxy radicals can further react with the polymer chains leading to the formation of hydroperoxides (ROOH). On exposure to heat or light, hydroperoxides decompose to yield more radicals that can reinitiate the degradation process.

Figure 1: Polymer degradation and stabilization



Antioxidants interrupt the degradation process

Antioxidants interrupt the degradation process in different ways according to their structure. The major classifications of antioxidants are listed below.

Primary Antioxidants, mainly acting in Cycle I of Figure 1 as chain-breaking antioxidants, are sterically hindered phenols. Primary antioxidants react rapidly with peroxy radicals (ROO·) to break the cycle.

ORTEGOL® AO 1, AO 2 and the ORTEGOL® AO 5 all contain this type of primary antioxidants. Secondary arylamines, another type of primary antioxidants, are more reactive towards oxygen-centered radicals than are hindered phenols. Synergism between secondary arylamines and hindered phenols leads to regeneration of the amine from the reaction with the phenol. ORTEGOL® AO 1 makes use of this synergism.

Secondary antioxidants, acting in Cycle II of Figure 1, react with hydroperoxide (ROOH) to yield non-radical, non-reactive products and are, therefore, frequently called hydroperoxide decomposers. Secondary antioxidants are particularly effective in synergistic combination with primary antioxidants. Our ORTEGOL® AO 2, especially recommended for ester foam, represents this type of synergistic composition.

A third group of high performance antioxidant blends perfectly combines primary and secondary antioxidant functions and, furthermore, includes a third option to interrupt the degradation cycle: efficient carbon-centered radical scavengers are part of our multifunctional antioxidant package ORTEGOL® AO 5. Autoxidation is inhibited as soon as it starts and the components in the product are further capable of regenerating phenolic antioxidants to provide new levels of overall processing stability. This threefold interruption of the degradation cycle makes this product particularly suitable when highest antioxidant performance is required.

With many antioxidants a sufficient reduction of the tendency to scorching is accompanied by some undesirable side effects. This does not apply to ORTEGOL® AO 5. The following points are to be mentioned in particular:

- Thanks to a low vapor pressure, a high boiling point and excellent temperature resistance the contribution of ORTEGOL® AO 5 to the fogging effect is extremely low in comparison to many commonly available products.
- When ORTEGOL® AO 5 comes into contact with textiles no migration and chemical reaction resulting in the formation of chromophoric compounds occurs, so that staining, which is much feared by foam manufacturers and users alike, is no problem.
- ORTEGOL® AO 5 is amine reduced which is particularly interesting in the view of emissions from foam. The typical antioxidant emissions in e. g. the VOC- and Fog-reports according to DaimlerChrysler can be significantly reduced using this multifunctional antioxidant.

Instructions for use

ORTEGOL® AO 5 can be dosed separately or in a premix with polyol depending on its solubility in the polyol in use.

The amount of ORTEGOL® AO 5 which is necessary to prevent scorching depends not only on the design of a formulation (the generated heat, the open-celled structure). Apart from this, the intensity of the oxidizing attack which has to be opposed is influenced by the character of the applied raw materials.

The purity of the blowing agents, for example, is known to have a significant influence on foam discoloration.

Furthermore, the type of polyol may also influence the use level of ORTEGOL® AO 5, because the compounds used for the so-called base stabilization of the polyol can interact with the components of ORTEGOL® AO 5. The best suited use level should therefore always be determined in trials.

We recommend 0.2 – 0.6 parts ORTEGOL® AO 5 per 100 parts polyol as a starting concentration for such trials.

Proper cleaning of equipment

It is normal to clean tanks, pipes filters and other equipment, which may have been in contact with ORTEGOL® AO 5, with conventional solvents such as Mesamoll, Toluene, Ketones, Ethers or NMP. It is vital that residues of such solvents used in the cleaning process are removed, with a high standard of care. Failure to do so may result in precipitation when the residues come into contact with ORTEGOL® AO 5. This precipitate may have an adverse effect on the foam production process leading to foam defects.

Packaging

720 kg pallet (4 x 180 kg in steel drums)
900 kg plastic containers

Information concerning

- classification and labelling according to regulations for transport of chemicals
- protective measures for storage and handling
- measures in case of accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

Legal References

This information and all further technical advice is based on our present knowledge and experience. However, it implies no liability or other legal responsibility on our part, including with regard to existing third party intellectual property rights, especially patent rights. In particular, no warranty, whether express or implied, or guarantee of product properties in the legal sense is intended or implied. We reserve the right to make any changes according to technological progress or further developments. The customer is not released from the obligation to conduct careful inspection and testing of incoming goods. Performance of the product described herein should be verified by testing, which should be carried out only by qualified experts in the sole responsibility of a customer. Reference to trade names used by other companies is neither a recommendation, nor does it imply that similar products could not be used.

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