

SWAB1EN0004

Advanced stabilization solutions for plastics

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Light stabilizers – a focus area of SONGWON

Industrialization of polyolefins started in the mid-1930s with low density polyethylene, while high density polyethylene and polypropylene became widespread during the 1960s and 1970s. Key development of UV stabilization strategies for polyolefins began in the mid-80s.

SONGWON, which has been involved in the development of stabilizers for plastics for over 50 years, works continuously to provide cutting edge solutions that meet increasingly high standards and stringent requirements.

UV stabilization of polyethylene based rotational molding

Hindered amine light stabilizers (HALS) are essential for polyethylene, because they boost light and long term thermal stability in both pigmented and unpigmented systems. They protect polymers from degradation due to UV exposure. They also act as long-term thermal stabilizers with low color generation. While monomeric HALS provide effective surface protection, polymeric HALS protect the core of the material.

SABO is a privately held specialty chemicals manufacturer founded in 1937 and based in Bergamo, Italy. With production in Italy and Mexico, SABO ranks as the second largest producer of HALS worldwide. SONGWON is the exclusive global distributor of SABO's range of HALS light stabilizers with the exception of Europe, where under a non-exclusive agreement the two companies remain as independent suppliers.

Rotational molding offers advantages over other molding processes such as reduced production costs, greater flexibility of design, excellent finish, uniform wall thickness, low waste and less stress on the parts than injection- or blow-molding processes. Significant improvements in equipment and technology, coupled with the development of polyethylene and other polymeric powders have enabled rotomolded parts to be used in a number of demanding applications, including the automotive sector.

EXP UV 0217 and EXP UV 0117 experimental light stabilizers achieve new standards

Different rotomolding application segments require different degrees of stabilization. Ratings for tanks, for example, vary from UV 8 (8,000 hours artificial weathering, long term protection) to UV 24 (24,000 hours artificial weathering, exceptional protection), while for indoor consumer articles a UV rating of 4 is sufficient.

In a joint development effort SABO and SONGWON developed together new experimental light stabilizers for the rotational molding market: both EXP UV 0217 and EXP UV 0117 can cover a wide range of requirements. EXP UV 0217, which achieves ratings of up to UV 12 and offers excellent UV stability in pigmented and unpigmented systems, is suitable for end products such as bulk containers. Tests showed that the experimental product performed similarly to the standard HALS at lower loading rates, demonstrating that it is highly cost effective.

With ratings of up to UV 16 and above, EXP UV 0117 outperforms classical HALS, a very important requirement in rotational molding. EXP UV 0117 is particularly recommended for water and chemical tanks.

Both products comprise a synergistic blend of HALS and UV absorbers, a combination that not only provides high levels of light stability but also improves long term thermal stability (LTTS). They perform excellently in unpigmented (natural) linear low density polyethylene (LLDPE), exhibiting low color after rotomolding and low volatility. SABO and SONGWON assessed the influence of pigments on light stability when bringing the new stabilizers EXP UV 0217 and EXP UV 0117 to the market.

Both EXP UV 0217 and EXP UV 0117 have broad indirect food contact approval. They can be incorporated in SONGWON's SONGNOX[®] OPS one pack systems, which contain antioxidants. EXP UV 0217 and EXP UV 0117 will be commercialized in the second half of 2018.

Ongoing research and innovation

With the aim of offering customers worldwide a choice of stabilizers for rotomolding that will cover all their needs, SABO and SONGWON are currently conducting further studies in rotational molding of thick section polyethylene, working amongst other things on special solutions for pigmented or black applications.

Low VOC stabilization of polypropylene based thermoplastic olefins (TPOs)

Originally, stabilization strategies focused solely on protecting the polymeric substrate. Nowadays, however, the emphasis is not only on ever higher quality end products but also, increasingly, on reducing the impact of these technologies on emissions.

In contrast to UV stabilizers for polyethylene (PE), those for polypropylene (PP) need to be mobile in the polymeric matrix, because an accumulation of the product at the surface of the substrate is essential to provide the necessary surface protection. Otherwise, increased amounts of light stabilizer will not necessarily retard the onset of degradation.

Today's UV stabilization packages for polypropylene thermoplastic olefins are required to combine effective protection with low generation of volatile oxygen compounds (VOCs). In order to achieve this, it is essential to understand the nature of the polymer matrix.

SABO®STAB UV 228 and SABO®STAB UV 229 are robust products that achieve a balance between molecular weight and diffusion speed, providing effective protection without increasing the generation of VOCs.

Future developments

Both, SABO and SONGWON invest highly in research and development and will continue to work on stabilization solutions for the polyolefin market.

Please be aware that in some countries the use of the products in certain applications may be subject to patent protection. Please consult your SONGWON representative for more information at techservice@songwon.com.