Luranyl®

(PPE + PS-I)

Product range
Properties
Processing
Applications

ROMIRA
TECHNISCHE KUNSTSTOFFE

Outstanding properties for innovative market success

Under the tradename Luranyl Romira supplies blends composed of poly(phenylene ether) and high-impact polystyrene. The product range comprises general-purpose grades, glass-fiber-reinforced and halogen-free flameproofed grades. Luranyl affords a combination of advantageous properties such as high heat resistance, good dimensional stability, resistance to hot water and low water absorption. Luranyl is easy to process which makes it particularly suitable for many areas of application.

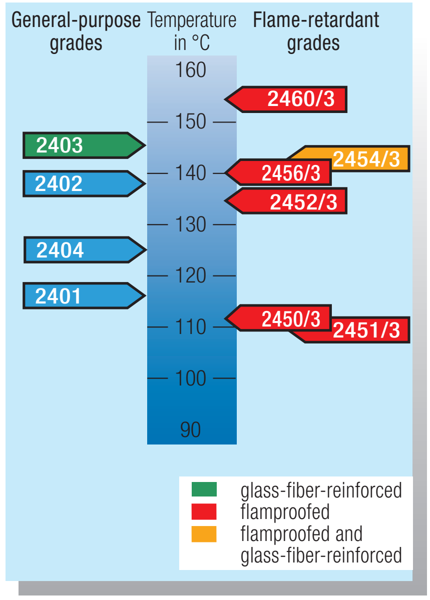

Fig. 1: The Luranyl product range

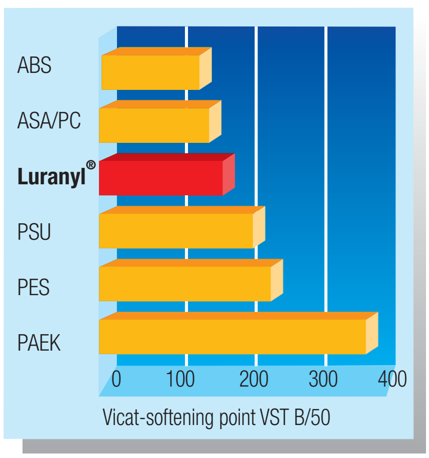

Fig. 2: Heat resistance of amorphous thermoplastics compared: ABS, ASA/PC, Luranyl, PSU, PES and PAEK

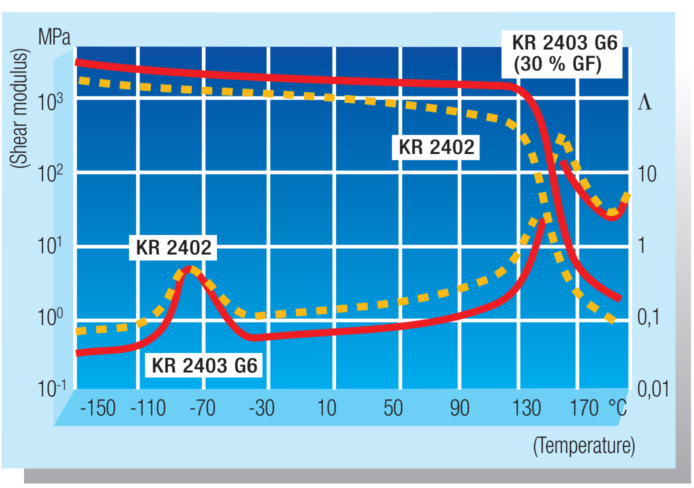

Fig. 3: Shear modulus (G) and logarithmic decrement of mechanical damping (L) (torsion pendulum test in accordance with ISO 6721-2) of Luranyl KR 2402 and KR 2403 G6 as a function of test temperature

Heat resistance

With a Vicat softening point of up to 160 °C Luranyl can be exposed to a long-term service temperature of 110 °C.

Accordingly, among the amorphous thermoplastics Luranyl is distinctly higher than ABS or ABS/PC blends and bridges the heat resistance gap to the high temperature thermoplastics PSU and PES.

The low temperature-dependence of the shear modulus additionally shows that Luranyl retains its rigidity over a wide range of temperatures (Fig. 3, Shear modulus curves).

Coefficient of linear expansion
The coefficient of linear expansion (23–28 °C) of Luranyl KR 2403 G6 is $3 \cdot 10^{-5}\,K^{-1}$ to $4 \cdot 10^{-5}\,K^{-1}$ and is just above that of aluminum. The value obtained for Luranyl KR 2403 G4 is $4 \cdot 10^{-5}\,K^{-1}$ to $5 \cdot 10^{-5}\,K^{-1}$.

Flameproofing without halogen compounds

Luranyl ignites on exposure to flame, burning with a very sooty, luminous flame and continuing to do so even when the ignition source has been removed. Using halogen-free flame retardants, Luranyl grades having significantly reduced flammability are obtained.

Depending on the flame retardant used, Luranyl products attain class FV 1 or FV 0 according to IEC 707 or V-1, V-0 or 5 V according to UL 94.

The flame-retardant Luranyl range comprises free-flowing and extremely free-flowing housing grades having good heat resistance, highly heat resistant injection molding grades, used e.g. for current-carrying parts, extending up to very highly heat resistant products (Vicat B/50 = 160 °C).

Flameproofed Luranyl grades typically exhibit high impact strength and low density (approx. 1.09 g/cm^3 unreinforced). The products can be processed, even at elevated temperatures, without undergoing mechanical degradation or liberating corrosive gases.

The Luranyl flame-retardant grades contain a specially developed flame retardant system. This avoids the stress cracking (edge cracking) of thin-walled moldings or parts having unfavorable wall thickness to flow path ratios often caused in PPE/polystyrene blends by standard flame retardants.

Luranyl is thus particularly suitable for use in electrical engineering, especially in electrical equipment such as small transformers and chargers.

Processing

The Luranyl grades may be processed by all methods known for thermoplastics. The most important techniques are injection molding and extrusion. Some grades, however, are also particularly suitable for blow molding and foaming.

General notes

Pre-drying

Luranyl pellets do not undergo change when stored in dry rooms. However, under unsuitable conditions Luranyl absorbs moisture at its surface. Although this does not change the properties of the product it can, depending on the moisture content, give rise to streaks, stripes or bubbles.

We therefore recommend that Luranyl be pre-dried at 80-100 °C for about 2-4 hours prior to processing.

Injection molding

A broad processing range, good thermal stability, low molding shrinkage and low tendency to warp allow troublefree injection molding.

Processing temperature

Luranyl molding compounds can generally be processed at melt temperatures between 260 and 300 °C, the upper temperature limit being applicable to glass-fiber-reinforced products.

The upper limit for grades containing flame retardants is 290 °C.

Mold temperature control

The effective mold surface temperature exercises a decisive effect on surface quality (luster, weld line marking), weld line strength, warpage, shrinkage and the tolerances of moldings. Mold surface temperatures between 60 and 100 °C should be selected for Luranyl molding compounds.

Demolding

Luranyl is readily demolded so that moldings with complex shapes are also possible.

Draft angles of 0.5 to 0.9 ° are generally sufficient.

Shrinkage and aftershrinkage

Shrinkage in Luranyl molding compounds is substantially less than in the case of semicrystalline plastics.

Molding shrinkage in the case of unreinforced grades is normally between 0.5 and 0.7 %, and even well below 0.5 % in exceptional cases. In zones of the molding in which a high holding pressure operates (close to the gate) it can even assume values close to 0 %. Depending on the glass fiber concentration the shrinkage is between 0.2 and 0.5 %.

In most applications aftershrinkage is negligible. It accounts for approximately 10 % of total shrinkage.

Reprocessing and recycling of scrap

It is possible to add up to 30 % of sprue waste from correctly processed Luranyl to fresh starting material provided it is clean and of the same grade and used for moldings in which this is appropriate. The normal grinding or cutting mills can be used for regrinding.

As a general rule, however, virgin material should be used for parts meeting high quality requirements.

Extrusion

Luranyl is highly suitable for the extrusion of sheet, solid and hollow profiles, and tubes.

The optimum melt temperature for the production of semi-finished products lies in the range between 240 and 270 °C.

Extrusion of the parison should ensue at a melt temperature of 250 to 260 °C.

In most cases maximum throughput of moldings of high mechanical quality is achieved at a melt temperature of approximately 280 °C.

Safety notes

Safety precautions in processing

When the products are correctly processed in well ventilated work areas no harmful effects on the health of those engaged in processing have been observed.

The MAK values (maximum allowable concentrations) of 100 ml/m^3 for toluene and 20 ml/m^3 for styrene have to be observed (TRGS 900 specifications [TRGS = German Technical Rules for Hazardous Substances]; MAK Values List, 1993). Experience shows that when Luranyl is correctly processed and suitable measures for ventilation are in place the concentrations are well below the aforementioned threshold values. The determination and evaluation of the concentrations of hazardous substances in the air and in work areas have to be carried out in accordance with the specifications in TRGS 402 and TRGS 100.

Luranyl and the environment

Waste disposal

In Germany Luranyl wastes are assigned the waste code 57108, polystyrene wastes. As fully cured plastic wastes they do not have to be handled in accordance with the ”German Waste and residues monitoring ordinance” which imposes special requirements for disposal.

Normally, therefore, Luranyl wastes can be disposed of in landfill sites (see Luranyl safety data sheet). To the best of our knowledge Luranyl wastes are inert in landfills. Luranyl is classed in the lowest possible German Water Pollution Class.

Resistance to hot water and low water absorption

Whenever resistance to hydrolysis and to hot water, acids and bases, high rigidity and dimensional stability are required the glass-fiber-reinforced Luranyl grades are the materials of first choice.

Scarcely any other thermoplastic allows the production of the most complex parts with minimum warpage and to the narrowest tolerances.

Relative to comparable glass-fiber-reinforced thermoplastics, moisture absorption is significantly lower (Fig. 4).

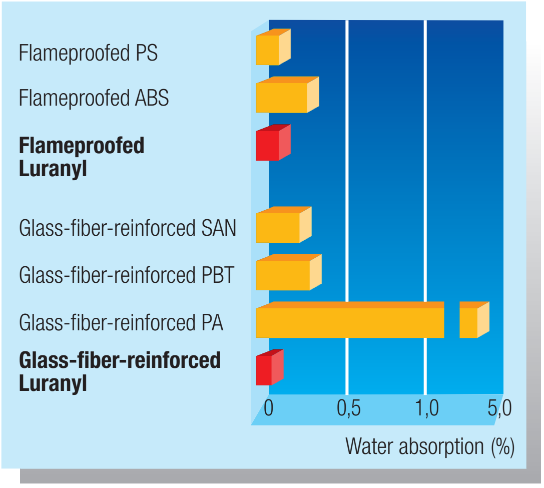

Fig. 4: Water absorption in 24 h at 23 °C (in accordance with DIN 53 495)

Resistant to hydrolysis up to 90 °C
The key requirement for use in hot water applications is outstanding resistance to hydrolysis at high temperatures. The upper limit for glass-fiber-reinforced Luranyl is 90 °C. The tensile creep test is a great aid for the designer in estimating the service life of a component, particularly in critical cases. The diagram shows the results of such tests at a temperature of 90 °C (Fig. 5).

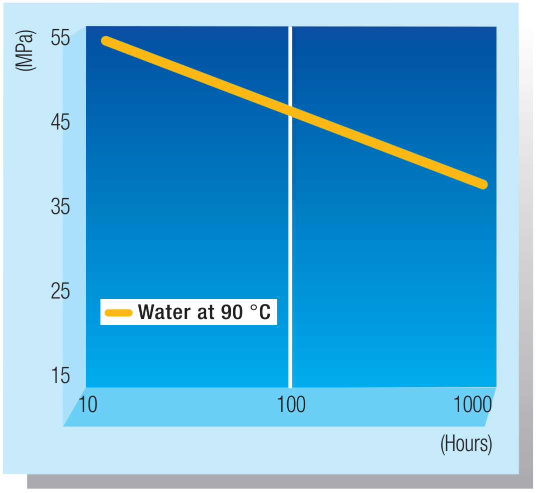

Fig. 5: Creep rupture curve (DIN 53 444) of Luranyl KR 2403 G6 in water

Resistance to chemicals
Luranyl is resistant to cold and hot water, detergents, alkalis and acids as well as to alcohol. A series of organic solvents causes swelling in part and dissolution in part. This applies both to halogenated and aromatic hydrocarbons and also to ketones.

Applications

Due to its outstanding engineering properties and troublefree ease of processing Luranyl is employed extensively in the construction and automotive sectors. Glass-fiber-reinforced grades are used for precision parts in plumbing and sanitary engineering and grades containing flame retardants find application in the office and communications sectors as well as in electrical engineering and consumer electronics.

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