Technical Product Information

Time is money: Speed up your process!

Nucleating agent Masterbatches for crystalline polymers imparting improved crystallization properties, shorter cycle-times, superior clarity isotropic shrinkage and enhanced physical properties in all fields of injection moulding and extrusion.

Effect
The process of the solidification of a molten polymer to the ready shaped part, determines basic characteristics of the product's properties. On the first view the outside shape determines the function of the piece but on a closer examination the internal structure steps into the foreground. Substantial physical characteristics of semi-crystalline polymers such as PP, PE, PA, PET or POM are crucially determined by their crystalline structure.

The addition of artificial nucleus supports the growth of crystals in an undercooled melt. By the addition of a Nucleating agent mainly two effects are achieved:

- The growth of spherulites starts at the artificially added stable nucleus of the Nucleating Masterbatch. This process begins at substantially higher temperatures as in not nucleated PP where the melt has to be cooled down at a significant higher degree. The addition of crystallization promoters speeds up the solidification of the polymers. This results in shorter cycle times.
- The number of stable crystallization nucleus is significantly higher than in not nucleated polymer. More crystals are built in the same volume; hence the diameter of them is smaller; ideally too small to be refractive. The polymer gets more transparent. Due to the smaller building blocks the mechanical properties like E-Modulus will increase as well as the heat distortion temperature. Uniform differential shrinkage is achieved with all colours. Since differential shrinkage is an important factor in part warpage, the selection of a nucleating agent can have an important effect on the dimensional stability of a final part.
Advantages of nucleation of semi crystalline Polymers

- **HDT / heat stability**
  Special nucleating agents like in CORDULEN ® NK 6521/PP can lift your heat deflection temperatures (HDT) approximately 20-25% over a non-nucleated PP and allow to significantly improve polymer resistance to distortion at elevated temperatures.

- **Dimensional stability**
  Polypropylene parts sometimes tend to warp due to the interaction of many factors like polymer orientation and differential shrinkage, mould and part design as well as and processing conditions. Nucleating agents can affect the potential for warpage by regulating the differential shrinkage of polypropylene. The more isotropic the shrinkage, the less the chance for warpage in a moulded part.

**Cycle time reduction**
Nucleating agents increase the temperature where polypropylene starts to crystallize. The crystallization temperature of a polymer is measured by differential scanning calorimetry. With this analysis can be proved that adding a nucleation Masterbatch can result in a 18°C increased crystallization temperature. This at the end can result in a reduced cycle time of more than 30%.
Chemical resistance / gas diffusion
Crystal Polypropylene shows much higher chemical resistance than amorphous PP. Due to the higher crystallinity of nucleated PP the resistance to chemical attacks is improved by nucleation. In the same manner will a higher degree of crystallization affect the transport of gas (e.g. oxygen) through the polymer. Gas diffusion in PP-food-packaging applications can be effective lowered by nucleating the polymer. Our great variety of PP- Nucleating Masterbatches in our product range can offer the best solution for almost every application. Starting from high- performance Clarifiers via organoleptic safe products, that don't affect taste and odour, to economical nucleating Masterbatches with focus on cycle time reduction and cost effectiveness there is a suitable product for nearly every purpose available.

CORDULEN ® NK Masterbatches are available for the following polymers:

- PE-LD, PE-HD
- PP-Homo, PP-Copo, PP-Random
- PA 6, PA 6.6
- EVA
- Other on demand
The information provided in this technical leaflet is intended to describe our products and their possible applications and corresponds to our present state of knowledge. It does not guarantee the suitability of particular product characteristics for specific use. June 2005.