FUNCTIONAL MODIFIERS
FUNCTIONAL POWDERS
MASTERBATCHES / POROUS
POLYMERIC ALLOYS
R & D

POLYMER ALLOYS MP-UHMWPE & HDPE

Combination of the best properties of separate materials, to create the best *Co-continuous nano-morphology.*
Ultra High Molecular Weight Polyethylene (UHMWPE) with all its advantages (good physical and mechanical properties, impact resistance, abrasion resistance, chemical and radiation resistance, biostability and biocompatibility), is practically not melt-processible. The main reason is high melt viscosity. This is because of the special morphology of long chains that represent a "confused tangle". As a result, when the melt temperature is reached, the material behaves as a "pseudo-crosslinked gel", leading to inability of melt mixing. The "chains mobility" of polymer is significantly reduced, which eventually leads to the fact that all the end products of such processing have "fusion defects" and strong graininess.

**NOVEL SOLUTION**

*Using our own propriety technology*
FORMING OF SPECIFIC "SHISH KEBAB" MORPHOLOGY OF UHMWPE IN THE MELT, BY SPECIALLY MODIFIED UHMWPE BLEND.

USING PROPRIETARY TECHNOLOGY OF EXTRUSION SYNTHESIS OF THE MELT-PROCESSIBLE UHMWPE (MP-UHMWPE)

GRANULAR MP-UHMWPE IS PERFECTLY PROCESSED ON STANDARD POLYMER EQUIPMENT: EXTRUDER, INJECTION MACHINE, CALENDERING SHEET LINE, BLOWN FORMATION LINE

THE FLEXIBILITY OF THE TECHNOLOGY ALLOWS PRODUCING CONCENTRATED BLENDS BASED ON MP UHMWPE. (THERMOPLASTIC URETHANES, RUBBER, TITANIUM NITRIDE ETC.)
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MP-UHMWPE

Main Applications

- Solid-phase grafting
- Sheets, panels
- Films
- Injection molding
- Pipes
- Coatings
- SSME dispersion
- Self-reinforced polymers
- Filament 3D
- Powder additives for polymers
- Self-reinforced polymer

Combining incompatible
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MP-UHMWPE

Morphology of standard UHMWPE (left) particle and UHMWPE of new generation (right). The grain-structure (left) and sponge-structure (right) are clearly visible.
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MP-UHMWPE

MP-UHMWPE - Melt processible UHMWPE of new generation.

CM-UHMWPE - Standard compression molded UHMWPE.

THE SAME AS THE STANDARD UHMWPE
Standard UHMWPE powder (left)

New MP-UHMWPE powder (right)

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**MP-UHMWPE**

**DISPERGATION OF NEW MP-UHMWPE IN HDPE (PIPE GRADE)**

a) Pure HDPE

b) HDPE with 10% MP-UHMWPE

c) HDPE with common UHMWPE
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MP-UHMWPE

MP-UHMWPE IN COMPARISON WITH COMMON UHMWPE

Common UHMWPE (left – grain structure of the cutoff clearly visible) vs MP-UHMWPE (right – welds are slightly visible).

This opens up new technological possibilities for the production of sheets and films on standard equipment (separators batteries, filters, etc.)
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MP-UHMWPE

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Standard</th>
<th>Parameters</th>
<th>Units</th>
<th>GUR 4150 Ticona</th>
<th>MP-UHMWPE</th>
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<tbody>
<tr>
<td>Density</td>
<td>ISO 1183</td>
<td>23°C</td>
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<td>Melt Flow Index</td>
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<td>Ultimate Tensile Strength</td>
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<td></td>
<td>%</td>
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<td>Charpy impact strength</td>
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<td>kJ/m²</td>
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<td>Shore Hardness</td>
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<td>Vicat softening temperature</td>
<td>ISO 306</td>
<td>50°C/h, 50 h</td>
<td>ºC</td>
<td>80</td>
<td>123</td>
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</table>

Heating timing related to the MP-UHMWPE as well.
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**MP-UHMWPE**

- *Easily* melt-processible for *any type of products* using standard polymer-processing equipment (extruder, injection machine, calender).
- *Physical* and *mechanical* properties are *higher* than the standard UHMWPE.
- *Tribological* properties are the *same* as the standard UHMWPE.
- *Excellent* biocompatibility (for medical purposes).
- *Easily* welded (unlike standard UHMWPE).
- *Easily* stretchable.
- *Can* be homogenized with *different grades* of HDPE.
- *Efficiency* of solid-phase *grafting* for MP-UHMWPE significantly *higher* than the *standard* UHMWPE (due to morphology).
- *Adjustable* porosity, 0% by default.
- Technology of production is environmentally friendly, *without* the *use* of *toxic solvents*.
- *Easily* colored in *any* color.
GRAFTALEN™ MP-UHHD 00850 - functions as a toughener, improves mechanical characteristics and increases abrasion resistance.

**Special Features and Benefits**
- Improves impact strength and impact resistance
- It can be used as modifier or as standalone material,
- Very high stiffness.

**Processing**
- **GRAFTALEN™ MP-UHHD 00850** can be processed with all usual processing technologies (Injection moulding, extrusion, blow moulding, thermoforming...)
- Optimal processing temperatures are between 180°C and 200°C.

GRAFTALEN™ HD-AR 00718 and GRAFTALEN™ HD-AR 00818

Is a high performance HDPE type, designed to be highly abrasion resistant. This grade contains proprietary copolymer system to increase abrasion resistance while maintaining HDPE’s processability and mechanical properties.

**Special Features and Benefits**
- Increases abrasion resistance of base materials,
- Widespread use, as it doesn’t contain any intrusive chemicals,
- Improves wear resistance.
**PRODUCT INFORMATION**

**GRAFTALEN™ HD-XL 15025** is a high performance HDPE type polymer, designed to crosslink when exposed to higher temperatures.

**Applications**

- Toughening additive for roto-molding applications
- Can be used as standalone material with crosslinking degree of >90%, or as an additive in roto-molding powders
- Provides excellent resistance against deformation at higher temperatures

**Processing**

**GRAFTALEN™ HD-XL 15025** is best used in roto-molding applications. It can be mixed with other PE roto-molding powders or used by itself.
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