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SIMONA® PP Semi-Finished Parts

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SIMONA® PP Semi-Finished Parts for Tank and Apparatus Construction

Polypropylene – a material with an asymmetrical chemical structure, as opposed to polyethylene – can be subdivided into groups according to various characteristics.

Initially, it is subdivided into three possible molecular structures depending on the position of the CH_3 group (methylene side group), which can be arranged in different ways during polymerisation.

Isotactic polypropylene

All the CH_3 groups are located on the same side of the carbon chain and point outwards in a helical arrangement.

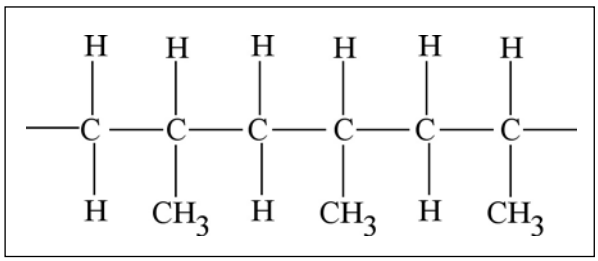


Figure 1: Diagram of isotactic PP

Syndiotactic polypropylene

The CH_3 groups occur in a regular sequence, alternating on different sides of the carbon chain.

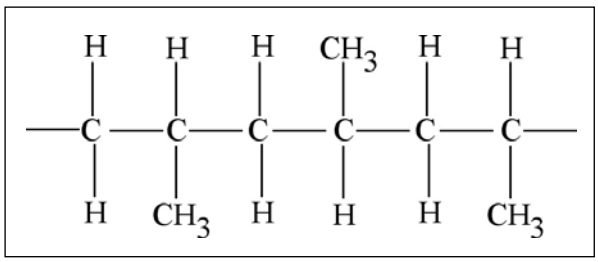


Figure 2: Diagram of syndiotactic PP

Atactic polypropylene

The CH_3 groups do not follow any rule regarding their position in relation to the main chain.

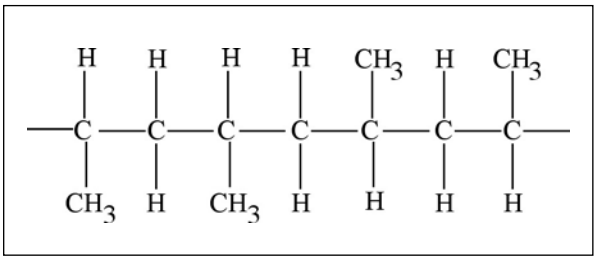


Figure 3: Diagram of atactic PP

For technical applications, isotactic PP is of greater importance because with rising isotacticity there is an increase in the degree of crystallinity, melting point, tensile strength, rigidity and hardness. Very high isotacticity leads to an increase in brittleness.

SIMONA® PP-DWST and SIMONA® PP-DWU AlphaPlus® semi-finished products are made of isotactic PP with an ideal ratio between rigidity and impact strength.

Compared to polyethylene, polypropylene has different properties:

- Lower density
- Higher glass transition temperature
- Higher melting point and hence higher dimensional stability under heat
- PP homopolymers are more brittle at low temperatures
- PP copolymers with ethylene are more resistant to impact at low temperatures

In the relevant standards and guidelines a fundamental distinction is made between the PP variants PP-H, PP-B and PP-R. PP-H is the **H**omopolymer (polymer of propylene) with properties typical of PP.

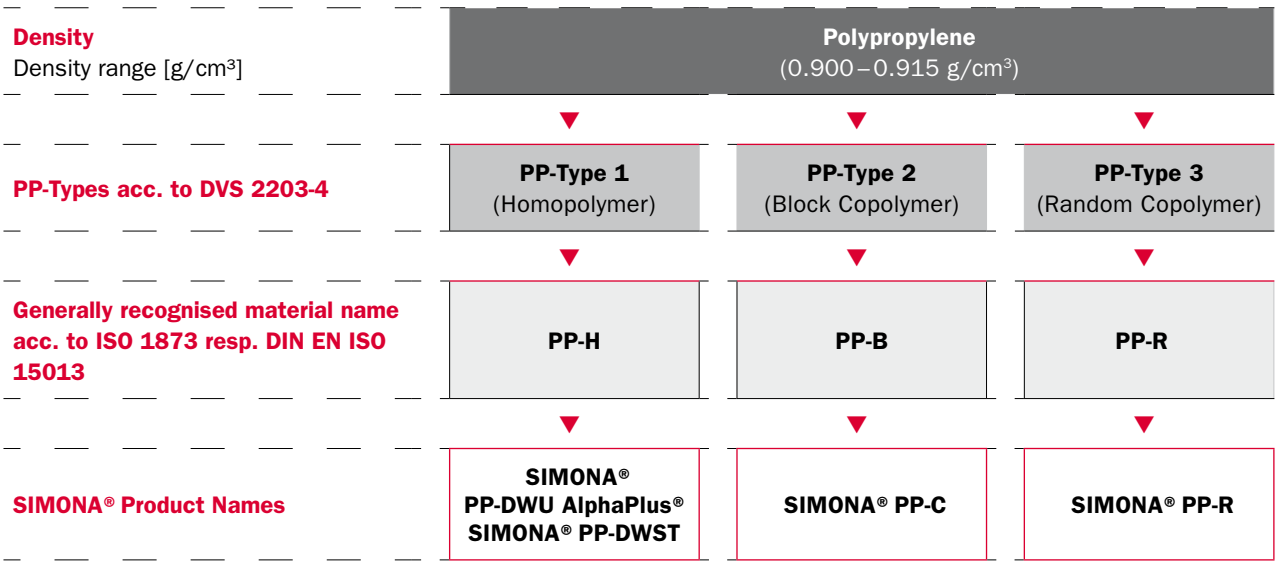
Abbr.	Description	Density range g/cm³	Molecular structure
PP-H	PP-Type 1 (Homopolymer)	0.905 – 0.915	P–P–P–P–P–P–P–P–P–P–P–
PP-B	PP-Type 2 (Block Copolymer)	0.900 – 0.910	P–P–E–E–P–P–P–P–E–E–P–P–
PP-R	PP-Type 3 (Random Copolymer)	0.900 – 0.910	P–P–E–P–P–P–E–E–P–P–P–E–P–

Figure 4: The density limit ranges may vary slightly depending on the source; (P = propylene, E = ethylene)

The copolymers (polymers of different monomers, usually propylene and ethylene in this case), PP **B**lock copolymers and PP **R**andom copolymers, on the other hand, are tougher. PP-B in particular has a higher reserve of impact strength at temperatures below 0 °C. However, PP-B and PP-R exhibit less rigidity, especially at temperatures above 60 °C. The explanation for this is the linking of ethylene to the molecular chain, which owing to its characteristics (higher impact strength at low temperatures, less rigidity at high temperatures) has an influence on the property profile of the polypropylene. The difference between a block copolymer (PP-B) and a random copolymer (PP-R) is the way in which comonomer ethylene is linked to the molecular chain (see Figure 4); in the case of PP-B it takes place in blocks and with PP-R the distribution is random.

SIMONA® PP-DWU AlphaPlus®: enhancement of standard PP-H

The proven SIMONA® PP-DWU was enhanced to become SIMONA® PP-DWU AlphaPlus® (moulding compound approved by the German Institute of Building Technology ‚DIBt'). By adding a special nucleation agent, the microstructure is influenced when the PP melt cools down, thus achieving a finer and more uniform structure. This has a positive influence on the strength, notched impact strength and weldability of the material.



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