Block Copolymer Toughener for Isotactic Polypropylene

Technology #20180226

New copolymer based Impact Modifier for isotactic polypropylene (iPP)

Isotactic polypropylene is the most common form of polypropylene. It is used in many large volume applications such as fibers and automotive. This new technology toughens isotactic polypropylene (iPP) by blending low concentrations of poly(ethylene-alt-propylene)-b-poly(ethylene-ran-ethyl ethylene) (PEP-PEEE) diblock copolymers in iPP. The copolymer toughening agents are hydrogenated isoprene/butadiene copolymers which spontaneously form uniformly dispersed nano-size rubber micelles. This additive at low concentrations provides improved tensile and impact properties while maintaining high strength. This technology could offer a new toughening agent for commercial iPP applications that require high impact strength.

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** Contact Larry Micek for specific details. **

Equivalent toughness with low loadings preserves high clarity and strength

Isotactic polypropylene (iPP) is intrinsically brittle under fast load or at low temperatures, limiting its use as a high-performance engineering plastic. Past attempts to improve toughness through compounding or blending with rubber have been most effective at high rubber content (>20 wt%) which significantly reduces the modulus and strength of the iPP. This new technology overcomes the undesirable properties when rubber additives are used while imparting toughness. By simply melt-blending this new toughening agents with iPP, impact and toughness of the blend dramatically improve. Because the block copolymers are rubbery in nature and designed to disperse during blending, increased toughness can be achieved with low loadings (5-10% wt%), preserving high clarity and strength. These blends increased Izod impact strength of iPP at least 5 times greater than that of other toughening agents and tensile strain at break by at least 20 times compared to other toughening agents.

BENEFITS AND FEATURES:

● Efficiently toughens isotactic PP
● Compatible in standard melt-blending operations as an additive
● Creates a new market for novel iPP additives using isoprene and butadiene monomers
● Imparts desirable mechanical (tensile and impact) properties at very low loadings
● Matches high strength of pure iPP while imparting toughness
● Izod impact strength at least 5 times greater than iPP
● Tensile strain at break at least 20 times greater than iPP

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APPLICATIONS:

- Commercial iPP products requiring impact strength and toughness
- Additive for toughening isotactic polypropylene (iPP)

Phase of Development - Prototype development.

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