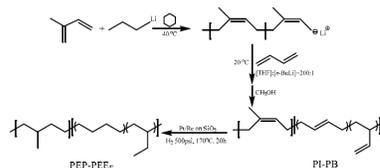
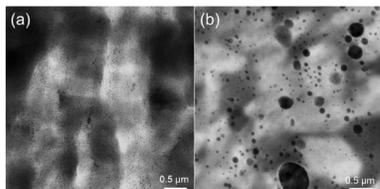


## Block Copolymer Micelle Toughened Isotactic Polypropylene (iPP)



Isotactic polypropylene (iPP), the most widely used form of polypropylene, has applications in very large markets such as fibers and automotive applications due to its excellent processability and low cost. However, brittleness at high strain rates and low temperatures hinders its use as a high-performance engineering plastic. Efforts to improve its toughness include blending iPP with additives including rigid particles, rubbers, and hybrid core-shell structures. However, the high rubber content required to obtain adequate toughness reduces both the modulus and strength of the iPP material.

### Description of the Invention

This new technology toughens isotactic polypropylene (iPP) by blending poly(ethylene-alt-propylene)-b-poly(ethylene-ran-ethyl ethylene) (PEP-PEEE) diblock copolymers in iPP at very low concentrations. These copolymer toughening agents are hydrogenated Isoprene/butadiene copolymers containing iPP-miscible and iPP-immiscible segments that spontaneously form uniformly dispersed nano-size rubber micelles. This micelle form delivers desirable mechanical (tensile and impact) properties at very low concentrations while maintaining the high strength of pure polypropylene. These blends improve 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.

### Features and Benefits

- Create a new market for novel iPP additives using isoprene and butadiene monomers
- Efficiently toughens isotactic iPP
- Compatible in standard melt-blending operations as an additive
- Imparts desirable mechanical (tensile and impact) properties at very low concentrations
- 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

### Potential Applications

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

### Technology Status

Prototype dev.

### Publications

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10.1021/acs.macromol.7b01656

### IP Status

Patent Pending

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### Case Reference

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