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Non-Confidential Description - PSU No. 2941
"One-pot Process of Preparing Long Chain Branched Polyolefin"

Keywords:

polyolefin, polypropylene, LCBPP, LCBPE, polymerization

Links:

Inventor website

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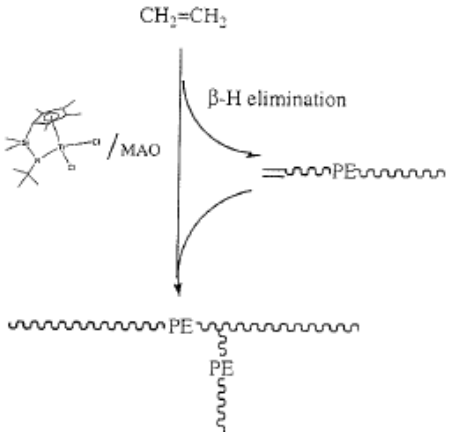

Fig 1: Preparing LCBPE via a reaction mechanism incorporating in situ generated polyethylene macromonomers

Background

A long chain branching polymer contains several side chain branches whose length is comparable to or longer than a critical entanglement length. Compared to the linear polymer having the same molecular weight, the long chain branched (LCB) polymer shows high shear sensitivity, zero shear viscosity, melt elasticity, and high impact strength. These polymers exhibit higher viscosities at low shear rates and lower viscosities at high shear rates. Shear thinning is known to be an advantage during the polymer processing (high shear conditions). On the other hand, high melt strength (increasing resistance to stretching during elongation of the molten material) is essential in thermoforming, extrusion coating, and blow molding processes (predominate elongational flows).

Invention Description

This invention discloses a novel *in situ* (one-pot) polymerization process of preparing polyolefin with a LCB molecular structure, using a novel "T" reagent that serves as the join between main and side chains during olefin polymerization. Specifically, the "T" reagent involves both comonomer and chain transfer reactions during transition metal-mediated olefin polymerization reaction. This *in situ*, one-pot process works for most olefin monomers polymerizable by transition metal catalysis and their mixtures. Furthermore, the resulting long chain branching polyolefins include the polymer having the same main and side chains, such as long-branched polyethylene (LCBPE) and long-chain branched polypropylene (LCBPP).

Advantages / Applications

- Allows polypropylene films and foams to be produced cost-effectively
- Charged polypropylene films could prove useful in semiconductor manufacturing
- All of the advantages of LCB polymers, including high shear sensitivity, zero shear viscosity, melt elasticity, and high impact strength

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