Methods of Hydrosilylation of Polypropylene

Background

A novel reactive extrusion process has been developed for the production of hydrosilylated polypropylene resins from commodity grade polypropylene. Several organofunctional silanes and siloxanes may be used to introduce terminal functionalities onto the base polypropylene resin, without introducing cross linking or non-linear polymer chains. Functionalization is accomplished through either a free radical or a catalytic reaction mechanism. Traditional hydrosilylation processes utilize solution chemistry that requires subsequent precipitation and drying processing steps, both of which require higher energy, material handling, and labour costs.

Description of the invention

This technology describes methods for preparing branched copolymers of polypropylene (PP) and polysilanes by procedures involving melt phase hydrosilylation. Such branched copolymers may be formed in situ during the melt phase hydrosilylation or may be prepared by subsequent processing. The branched copolymers exhibit superior properties. This invention relates to the hydrosilylation of polypropylene and other polymers, particularly terminal double bonds provided therein. The hydrosilylation reaction is namely the addition of a silicone hydride to a multiple bond, such as: carbon-carbon, carbon-nitrogen, nitrogen-nitrogen, carbon-oxygen, and nitrogen-oxygen. The present invention provides a way to chemically alter polypropylene and other polymers to increase features such as: adhesion, chemical reactivity, or hydrophilicity. Thus, this procedure further opens a path to the formation of interesting copolymers, the production of compatibilizers for inorganic fillers, or polymer blends. Subsequent studies have demonstrated the ability to use the hydrosilylation process to introduce styrenic functionality to polypropylene.

Advantages

This process provides a way to modify polypropylene with desirable functionality, such as increased adhesion, chemical reactivity, or hydrophilicity characteristics. Moreover, this procedure opens a path to the formation of new and interesting di-block copolymers and compatibilizers for polymer blends or inorganic fillers. Furthermore, this invention offers a unique way to produce hydrosilylated polypropylene in the melt phase, thus allowing for a single step reactive-extrusion process which requires less energy, material handling, and labour costs.

Potential applications

This process is applicable to all types of polyolefins or any other polymers which are inert to the conditions of the hydrosilylation. This process will be of interest to manufacturers of modified/engineered plastics and EPDM rubber.