A PROCESS TO PRODUCE POLYOLEFIN IONOMERS AND IONOMERS PRODUCED THEREBY

Field of Invention

The instant invention relates to a process to produce polyolefin ionomers and ionomers produced thereby.

Background of the Invention

Polyolefins are useful materials as high molar mass polymers. The high chemical and oxidation resistance coupled with the competitive price of saturated polyolefin materials make polyolefins highly desirable to the plastics industry. It has been demonstrated that controlled inclusion of functional groups on the polyolefins can lead to property enhancements. However, despite the vast number of materials and applications derived from polyolefins, their pre-polymers for the formation of ionically associated polyolefins are an under-explored area. This is primarily because precise and controlled functionalization has been challenging. Most methods for incorporation of reactive groups in polyolefins involve post-polymerization reactions, which generally have poor control over the functionalization location and quantity and leads to diminished mechanical properties. The synthesis of moldable, injectable, and otherwise processable polyolefin reactive telechelic pre-polymers, that form polyolefin ionic associations, would provide a desirable combination of low viscosity and good tensile properties.

Summary ~~of the Invention~~

The instant ~~invention~~ disclosure is a process to produce polyolefin ionomers and ionomers produced thereby.

In one ~~embodiment~~aspect, the instant ~~invention~~ disclosure provides a process to produce an ionomer comprising reacting alkyl-*cis*-cyclooctene and *cis*-cyclooctene in a mole ratio from 0:1 to 1:0 in the presence of a difunctional acidic chain transfer agent under ring opening metathesis polymerization conditions to form an unsaturated polyolefin reactive dicarboxylic acid telechelic pre-polymer; hydrogenating the unsaturated polyolefin reactive dicarboxylic acid telechelic pre-polymer to produce a hydrogenated polyolefin reactive dicarboxylic, telechelic pre-polymer; reacting the hydrogenated polyolefin reactive telechelic pre-polymer with at least one compound according to the

formula $aM^x + b(R)^y$, wherein M is a metal, x is a charge of M, R is an alkyl, aryl, oxide, or fatty acid, y is a charge of R, a and b are integers of at least 1, and ax+by=0, to form an ionomer.

In another aspect, there is provided an ionomer produced according to the process as defined herein.

Brief Description of the Drawings

For the purpose of illustrating the invention, there is shown in the drawings a form that is exemplary; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

Fig. 1 is a graph illustrating the DMTA of Hydrogenated Pre-polymer 1 taken with 25 mm Parallel Plate Geometry; Temperature ramp 0.5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%;

Fig. 2 is a graph illustrating the DMTA of Hydrogenated Pre-polymer 2 taken with 25 mm Parallel Plate Geometry; Temperature ramp 5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%;

Fig. 3 is a graph illustrating the DMTA of Hydrogenated Pre-polymer 3 taken with 25 mm Parallel Plate Geometry; Temperature ramp 5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%;

Fig. 4 is a graph illustrating the DMTA of Inventive Example 1 taken with 25 mm Parallel Plate Geometry; Temperature ramp 0.5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%;

Fig. 5 is a graph illustrating the DMTA of Inventive Example 2 taken with 8 mm parallel plate geometry; Temperature ramp 5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%;

Fig. 6 is a graph illustrating the DMTA of Inventive Example 3 taken with 8 mm parallel plate geometry; Temperature ramp 5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%;

Fig. 7 is a graph illustrating the DMTA of Inventive Example 4 taken with 25 mm parallel plate geometry; Temperature ramp 5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%; and

Fig. 8 is a graph illustrating the DMTA of Inventive Example 5 taken with 25 mm parallel plate geometry; Temperature ramp 5°C min^{-1}; ω = 6.28 rad s^{-1} and γ = 0.05%.

Detailed Description of the Invention

The instant invention is a process to produce polyolefin ionomers and ionomers produced thereby.

The process to produce a polyolefin difunctional acid reactive telechelic pre-polymer according to the present invention comprises reacting alkyl-*cis*-cyclooctene and *cis*-cyclooctene in a mole ratio from 0:1 to 1:0 in the presence of a difunctional acidic chain transfer agent under ring

opening metathesis polymerization conditions to form an unsaturated polyolefin reactive dicarboxylic acid telechelic pre-polymer; hydrogenating the unsaturated polyolefin reactive dicarboxylic acid telechelic pre-polymer to produce a hydrogenated polyolefin reactive dicarboxylic,