CARRIER FOR OLEFIN POLYMERIZATION CATALYST, AND PREPARATION METHOD THEREFOR AND APPLICATION THEREOF

Cross-reference to Related Applications

This application claims the priority to Chinese patent application CN201811224586.4 filed on October 19, 2018 entitled "Spherical carrier for olefin polymerization catalyst and preparation method thereof, catalyst component and catalyst and use thereof", the entirety of which is incorporated herein by reference.

Field of the Invention

The present disclosure relates to the field of olefin polymerization, and in particular, relates to a carrier for olefin polymerization catalyst and a preparation method thereof, as well as a catalyst component for olefin polymerization and a catalyst and an olefin polymerization method.

Background of the Invention

Recent years have witnessed rapid development in the polypropylene industry and a constantly rising proportion of polypropylene in general plastics and even in special plastics. This is mainly because of the advancement of catalyst technology, the development of propylene polymerization technology, and the accompanying further expansion of performance of propylene polymers. Catalysts for propylene polymerization include Ziegler-Natta catalysts, metallocene catalysts, and non-metallocene catalysts. Among them, Ziegler-Natta catalysts have always been the most important catalytic system in propylene polymerization production. Ziegler-Natta catalysts started in 1950s and remain one of the main catalysts in industrial production after having been upgraded many times. Research on Ziegler-Natta catalysts has also always been one of the hot spots in research on catalysts for propylene polymerization.

according to the second aspect of the present invention and/or the catalyst component according to the third aspect of the present invention in preparation of a catalyst for olefin polymerization.

The present invention, in its fifth aspect, provides a catalyst for olefin polymerization. The catalyst comprises: (1) the catalyst component according to the third aspect of the present invention; (2) an alkyl aluminum compound; and (3) an optional external electron donor compound.

According to the present invention, in the above catalyst for olefin polymerization, the alkyl aluminum compound may be any alkyl aluminum compound commonly used in the field of olefin polymerization that can be used as a co-catalyst for an olefin polymerization catalyst. Preferably, the alkyl aluminum compound is a compound represented by Formula XIII.

$AlR'_{n'}X'_{3-n'}$ Formula XIII

In Formula XIII, R' is C_1-C_8 alkyl or halogenated alkyl; X' is halogen, preferably one or more selected from chlorine, bromine, and iodine, more preferably chlorine; and n' is an integer from 1 to 3.

More preferably, the alkyl aluminum compound is one or more selected from a group consisting of triethyl aluminum, tripropyl aluminum, tri-n-butyl aluminum, tri-isobutyl aluminum, tri-n-hexyl aluminum, tri-n-octyl aluminum, tri-isobutyl aluminum, diethyl aluminum monohydrogen, diisobutyl aluminum monohydrogen, diethyl aluminum chloride, diisobutyl aluminum chloride, ethyl aluminum dichloride, $Al(n\text{-}C_6H_{13})_3$, and $Al(n\text{-}C_8H_{17})_3$.

Most preferably, the alkyl aluminum compound is triethyl aluminum and/or triisobutyl aluminum.

According to the present invention, an amount of the alkyl aluminum compound may be a conventional amount in the art. Preferably, a molar ratio of aluminum in the alkyl aluminum compound to titanium in the catalyst component is (1-2000):1. More

that, a resulting mixture was subjected to filter pressing. A product resulted from the filter pressing was washed with hexane five times. Finally, a resulting product was vacuum dried to obtain a spherical carrier Z7 for an olefin polymerization catalyst.

The spherical carrier Z7 for an olefin polymerization catalyst has an average particle diameter (D50) of 45.1 microns. As it is observed through an optical microscope, particles of the spherical carrier Z7 for an olefin polymerization catalyst have relatively regular morphology and smooth surfaces, are basically all spherical, have a relatively narrow particle size distribution, and have basically no non-spherical particles, as shown in Fig. 3.

Preparation Example 8

This preparation example is used to illustrate a spherical carrier for an olefin polymerization catalyst provided by the present invention and a preparation method thereof.

8.0 g (0.08 mol) of magnesium chloride, 28 mL (0.48 mol) of ethanol, 5 mL of tetramethylthiuram monosulfide, 1 g of PVP (polyvinylpyrrolidone) as a surfactant were added to a 0.6-L reactor, and heated under stirring to 70°C. A resulting mixture was subjected to a reaction at 70°C for 1 hour, followed by adding 11.2 mL (0.16 mol) of epoxypropane, and then again subjected to a reaction at 70°C for 20 minutes. After that, a resulting mixture was subjected to filter pressing. A product resulted from the filter pressing was washed with hexane five times. Finally, a resulting product was vacuum dried to obtain a spherical carrier Z8 for an olefin polymerization catalyst.

The spherical carrier Z8 of an olefin polymerization catalyst has an average particle diameter (D50) of 50.1 microns. As it is observed through an optical microscope, particles of the spherical carrier Z8 for an olefin polymerization catalyst have relatively regular morphology and smooth surfaces, are basically all spherical, have a relatively narrow particle size distribution, and have basically no non-spherical particles, as shown in Fig. 4.

Comparative Preparation Example 1

This comparative preparation example is used to illustrate a spherical carrier for an olefin polymerization catalyst and a preparation method thereof used for comparison.

0.08 mol of magnesium chloride, 0.96 mol of ethanol, 1 g of PVP (polyvinylpyrrolidone) as a surfactant were added to a 0.6-L reactor, and heated under stirring to 90°C. A resulting mixture was subjected to a reaction at 90°C for 2 hours, followed by adding 38 mL(0.48 mol) of epoxychloropropane, and then again subjected to a reaction at 90°C for 0.5 hour. After that, a resulting mixture was subjected to filter pressing. A product resulted from the filter pressing was washed with hexane five times. Finally, a resulting product was vacuum dried to obtain a spherical carrier DZ1 for an olefin polymerization catalyst.

The spherical carrier DZ1 for an olefin polymerization catalyst has an average particle diameter (D50) of 60 microns, and a particle size distribution ((D90-D10)/D50) of 1.3. Morphology of particles of the carrier observed through an optical microscope is as shown in Fig. 5. As can be seen from Fig. 5, the particles of the carrier DZ1 for an olefin polymerization catalyst include non-spherical particles, and surfaces of the particles of the carrier DZ1 are relatively rough.

Comparative preparation example 2

8.0 g (0.08 mol) of magnesium chloride, 59 mL (0.48 mol) of cyclohexane methanol, 1 g of PVP (polyvinylpyrrolidone) as a surfactant were added to a 0.6-L reactor, and heated under stirring to 60°C. A resulting mixture was subjected to a reaction at 60°C for 1 hour, followed by adding 12.5 mL (0.16 mol) of epoxychloropropane, and then again subjected to a reaction at 60°C for 20 minutes. After that, a resulting mixture was subjected to filter pressing. A product resulted from the filter pressing was washed with hexane five times. Finally, a resulting product was vacuum dried to obtain a spherical carrier DZ2 for an olefin polymerization catalyst.

The spherical carrier DZ2 for an olefin polymerization catalyst has an average