

FLUORINATED CATALYST SUPPORTS AND CATALYST SYSTEMS

BACKGROUND

[0001] A number of catalyst compositions containing single site catalysts have been used to prepare polyolefins, producing relatively homogeneous copolymers at good polymerization rates. In contrast to traditional Ziegler-Natta catalyst compositions, single site catalyst compositions, such as metallocene catalysts, are catalytic compounds in which each catalyst particle contains one or only a few types of polymerization sites.

[0002] To achieve acceptable and economically viable polymerization activities with single site catalyst systems, a large amount of activator such as methylaluminoxane ("MAO") is often required. Such activators are often expensive and the large amount of activator required to produce an active single site catalyst for polymerization has been a substantial impediment to the commercialization of single site catalysts for polyolefin production.

SUMMARY

[0003] The present disclosure provides a method for making a catalyst support. The method includes forming a mixture of a support material and a fluoride donor. The mixture is added to a fluidized bed reactor. The mixture is fluidized to form a fluidized bed while maintaining a flow rate of a fluidizing gas of about 0.1 ft. / sec at less than about 370 °C and greater than about 0.35 ft./ sec at temperatures greater than about 370 °C. The mixture is calcined to decompose the fluoride donor, forming a fluorinated support.

[0003a] In one aspect, there is provided a catalyst system, comprising: a catalyst compound including a metal; a support comprising a fluorinated support, wherein the fluorinated support is generated by heating a mixture of a catalyst support that can be fluorinated and a fluoride donor compound in a fluidized bed reactor that is fluidized by maintaining a flow rate of a fluidizing gas of 0.1 ft. / sec at less than 370 °C and greater than 0.35 ft./ sec at temperatures greater than 370 °C, and wherein the fluorinated support is substantially free of particles having a fluorine concentration from 13.9 wt. % to 26.9 wt.%; and an aluminoxane, wherein the aluminoxane is present in an amount of 10 mmol or less per gram of the support.

[0004] The present disclosure also provides a catalyst system. The catalyst system includes a catalyst compound, a fluorinated support, and an aluminoxane compound. The fluorinated support is generated by heating a catalyst support and a fluoride donor compound while maintaining a flow rate of a fluidizing gas of about 0.1 ft. / sec at less than about 370 °C and greater than about 0.35 ft./ sec at temperatures

greater than about 370 °C. The aluminoxane is present in an amount of about 10 mmol or less per gram of the support.

DESCRIPTION OF THE DRAWINGS

[0005] The advantages of the present techniques are better understood by referring to the following detailed description and the attached drawings, in which:

[0006] Figure 1 is a simplified process flow diagram of a catalyst activator system that may be used in embodiments;

[0007] Figure 2 is a simplified process flow diagram of another catalyst activator that may be used in embodiments;

[0008] Figure 3 is a plot showing the bed expansion of raw Siral 40 versus the flow of the fluidizing gas (SGV);

CLAIMS

What is claimed is:

1. A catalyst system, comprising:
a catalyst compound including a metal;
a support comprising a fluorinated support, wherein the fluorinated support is generated by heating a mixture of a catalyst support that can be fluorinated and a fluoride donor compound in a fluidized bed reactor that is fluidized by maintaining a flow rate of a fluidizing gas of 0.1 ft. / sec at less than 370 °C and greater than 0.35 ft./sec at temperatures greater than 370 °C, and wherein the fluorinated support is substantially free of particles having a fluorine concentration from 13.9 wt. % to 26.9 wt.%; and
an aluminoxane, wherein the aluminoxane is present in an amount of 10 mmol or less per gram of the support.
2. The catalyst system of claim 1, wherein the support has a fluoride concentration ranging from 1 wt. % to 10 wt. %, based on a weight of the support and an aluminum concentration ranging from 3 wt. % to 40 wt. % based on the weight of the support.
3. The catalyst system of claim 1, wherein the support has a fluoride concentration ranging from 4 wt. % to 8 wt. %, based on a weight of the support and an aluminum concentration ranging from 20 wt. % to 40 wt. % based on the weight of the support.
4. The catalyst system of claim 1, wherein the support has a fluoride concentration ranging from 2 wt. % to 4 wt. %, based on a weight of the support and an aluminum concentration ranging from 3 wt. % to 10 wt. % based on the weight of the support.
5. The catalyst system according to claim 1, wherein a concentration of the metal from the catalyst compound ranges from 0.2 wt. % to 1.3 wt. %, based on a total weight of the catalyst system.
6. The catalyst system according to claim 1, wherein the aluminoxane is present in an amount of 4 mmol or less per gram of the support.

7. The catalyst system according to claim 1, wherein the aluminoxane is present in an amount of 2.7 mmol or less per gram of the support.
8. The catalyst system according to claim 1, wherein the aluminoxane comprises methylaluminoxane, modified methylaluminoxane, or a combination thereof.
9. The catalyst system according to claim 1, wherein the support further comprises silica.
10. The catalyst system according to claim 1, wherein the catalyst compound comprises a metallocene catalyst.

11. The catalyst system of claim 10, wherein the metallocene catalyst has the formula:



wherein M is a Group 4, 5 or 6 atom; Cp^{A} and Cp^{B} are each bound to M and are independently selected from the group consisting of cyclopentadienyl ligands, substituted cyclopentadienyl ligands, ligands isolobal to cyclopentadienyl and substituted ligands isolobal to cyclopentadienyl; (A) is a divalent bridging group bound to both Cp^{A} and Cp^{B} selected from the group consisting of divalent C_1 to C_{20} hydrocarbyls and C_1 to C_{20} heteroatom containing hydrocarbonyls, wherein the heteroatom containing hydrocarbonyls comprise from one to three heteroatoms; X is a leaving group selected from the group consisting of chloride ions, bromide ions, C_1 to C_{10} alkyls, and C_2 to C_{12} alkenyls, carboxylates, acetylacetonates, and alkoxides; and n is an integer from 1 to 4.