The particles formed are dried in air and activated in an oxygen-containing atmosphere. The activated catalyst intermediate is reduced with an organic aluminum compound.

[010] Durand et al., in U.S. Pat. No. 5,075,395, teach a process for elimination of the induction period in the polymerization of ethylene. The polymerization is conducted with a charge powder in the presence of a catalyst comprising a chromium oxide compound associated with a granular support and activated by thermal treatment, this catalyst being used in the form of a prepolymer. The Durand process is characterized in that the charge powder employed is previously subjected to a treatment by contacting the charge powder with an organoaluminum compound in such a way that the polymerization starts up immediately after the contacting of the ethylene with the charge powder in the presence of the prepolymer.

[011] The above described chromium-based catalysts may be used to produce select grades of polymers. Very often, polymerization reactors are required to produce a broad range of products, having flow indices that may vary from 0.1 dg/min to about 100 dg/min, for example. The flow index response of a chromium-based catalyst refers to the range of the flow index of the polymer made by the catalyst under a given set of polymerization conditions.

SUMMARY

[012] There is provided a method of preparing a chromium-based catalyst for the polymerization of an olefin into a polyolefin, the method including: contacting a chromium-based catalyst with a reducing agent in a solvent to lower an oxidation state of at least some chromium in the chromium-based catalyst to give a reduced chromium-based catalyst; drying the reduced chromium-based catalyst at a drying line-out temperature; and adjusting the drying line-out temperature to change the flow index response of the reduced chromium-based catalyst.

[013] There is also provided a method of preparing a chromium-based catalyst for the production of polyolefin, the method including: contacting a chromium-based catalyst with a reducing agent in the presence of a solvent in a mix vessel to produce a reduced chromium-based catalyst; evaporating the solvent at a drying temperature to dry the reduced chromium-based catalyst; and specifying the drying temperature to give a desired flow index response of the reduced chromium-based catalyst.

[013a] In one aspect, there is provided a method of preparing a chromium-based catalyst for the production of polyolefin, the method comprising: contacting a chromium-based catalyst with a reducing agent in presence of a solvent in a mix vessel to produce a reduced chromium-based catalyst; evaporating the solvent at a drying temperature to dry the reduced chromium-based catalyst; and changing a flow index response of the reduced chromium-based catalyst to give a desired flow index response by adjusting the drying temperature, wherein the chromium-based catalyst comprises a chromium oxide catalyst.

[014] There is also provided a method including preparing a chromium oxide catalyst for the polymerization of an olefin into a polyolefin, the preparing involving:

mixing the chromium oxide catalyst with a reducing agent in a solvent to give a reduced chromium oxide catalyst; removing solvent from the reduced chromium oxide catalyst at a specified temperature set point; and adjusting the specified temperature set point to give a desired flow index response of the reduced chromium oxide catalyst. The method includes collecting the reduced chromium oxide catalyst for delivery to a polyolefin polymerization reactor.

[014a] In another aspect, there is provided a method comprising: preparing a chromium oxide catalyst for the polymerization of an olefin into a polyolefin, the preparing comprising: mixing the chromium oxide catalyst with a reducing agent in a solvent to give a reduced chromium oxide catalyst; removing solvent from the reduced chromium oxide catalyst at a specified temperature set point; and changing a flow index response of the reduced chromium oxide catalyst to give a desired flow index response by adjusting the specified temperature set point; and collecting the reduced chromium oxide catalyst for delivery to a polyolefin polymerization reactor.

BRIEF DESCRIPTION OF THE DRAWINGS

[015] FIG. 1 is a block flow diagram of a reducing system for chromium-based catalyst in accordance with embodiments of the present techniques.

[016] FIG. 2 is a simplified process flow diagram of the reducing system of FIG. 1 in accordance with embodiments of the present techniques.

[017] FIG. 3A is a diagrammatical representation of a conduit extension for a mix vessel of a chromium-based catalyst reducing system in accordance with embodiments of the present techniques.

[018] FIG. 3B is a diagrammatical representation of an entrance arrangement employing the conduit extension of FIG. 3A in accordance with embodiments of the present techniques.

[019] FIG. 4 is a bar chart of exemplary flow index in a laboratory slurry-phase polymerization reactor as a function of entrance arrangement for reducing agent to an upstream pilot-plant catalyst mix vessel in accordance with embodiments of the present techniques.

[020] FIG. 5 is a bar chart of exemplary flow index in a pilot-plant gas-phase reactor as a function of entrance arrangement for reducing agent to an upstream pilot-plant catalyst mix vessel in accordance with embodiments of the present techniques

[021] FIG. 6 is a plot of a fitted curve of example data of flow index in a laboratory slurry-phase polymerization reactor as a function of catalyst drying temperature in an upstream pilot-plant catalyst mix vessel in accordance with embodiments of the present techniques.

[022] FIG. 7 is a plot of a fitted curve of example data of flow index in a pilot-plant gas-phase reactor as a function of catalyst drying temperature in an upstream pilot-plant catalyst mix vessel in accordance with embodiments of the present techniques.

[023] FIG. 8 is a block diagram of a method of preparing a chromium-based catalyst including adjusting catalyst drying temperature for the polymerization of an olefin into a polyolefin in accordance with embodiments of the present techniques.

CLAIMS

What is claimed is:

1. A method of preparing a chromium-based catalyst for the production of polyolefin, the method comprising:

contacting a chromium-based catalyst with a reducing agent in presence of a solvent in a mix vessel to produce a reduced chromium-based catalyst;

evaporating the solvent at a drying temperature to dry the reduced chromium-based catalyst; and

changing a flow index response of the reduced chromium-based catalyst to give a desired flow index response by adjusting the drying temperature,

wherein the chromium-based catalyst comprises a chromium oxide catalyst.

2. The method of claim 1, wherein the drying temperature is less than 68° C.

3. The method of claim 1, wherein the drying temperature is less than 76 °C.

4. The method of claim 1, wherein evaporating comprises increasing an operating temperature of the mix vessel from a reaction temperature to the drying temperature.

5. The method of claim 1, wherein evaporating comprises increasing a jacket temperature of the mix vessel from a reaction temperature to the drying temperature.

6. The method of claim 1, wherein evaporating comprises reducing an operating pressure of the mix vessel.

7. The method of claim 1, wherein the chromium-based catalyst comprises an inorganic oxide support having a pore volume of 0.5 to 6.0 cubic centimeters (cm^3)/gram (g) and a surface area of 200 to 600 square meters (m^2)/g.

8. A method comprising:

preparing a chromium oxide catalyst for the polymerization of an olefin into a polyolefin, the preparing comprising:

mixing the chromium oxide catalyst with a reducing agent in a solvent to give a reduced chromium oxide catalyst;

removing solvent from the reduced chromium oxide catalyst at a specified temperature set point; and

changing a flow index response of the reduced chromium oxide catalyst to give a desired flow index response by adjusting the specified temperature set point; and

collecting the reduced chromium oxide catalyst for delivery to a polyolefin polymerization reactor.

9. The method of claim 8, wherein the reducing agent comprises an alkyl aluminum alkoxide.